



Agricultural Stall at the Congress Exhibition (March 1954), Bangalore

The Mysore Agricultural Journal

(The Organ of the Mysore Agricultural and Experimental Union)

Vol. 30, January to March 1954, No. 1

IN THIS ISSUE

DEVELOPMENT OF DAIRYING IN INDIA

NEEM AND ITS USES

SUGARCANE LEAF-HOPPER (*PYRILLA*)

PADDY CULTIVATION IN BABBUR FARM

The Mysore Agricultural Journal

(Organ of the Mysore Agricultural and Experimental Union
5/1, Sri Jayachamarajendra Road, Bangalore-2)

Vol. XXX

January to March 1954

No. 1

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Published quarterly in March, June, September and December. Copies are obtainable from the Secretary at Re. 1 per copy or by subscription at Rs. 3 a year. Non-editorial correspondence should be addressed to the Secretary. Editorial communications, new exchanges, books for review, may please be addressed to the Editor, Mysore Agricultural Journal, Department of Agriculture, Seshadri Road, Bangalore-1.

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CONTENTS

	PAGE
EDITORIAL	1
ORIGINAL ARTICLES	
<i>Development of Dairying in India during the First Half of the Twentieth Century—BY DR. T. M. PAUL ..</i>	5
<i>A Note on the Biology and Habits of Ricania fenestrata Fabricius, A New Pest on Jasmine—BY DR. M. PUTTARUDRIAH AND B. M. MAHESWARIAH ..</i>	12
<i>Groundnut Breeding in Mysore: Review of Progress—BY K. GOPALA IYENGAR</i>	16

	PAGE
<i>A Note on the Change in the Status of the Sugarcane Leaf-hopper Dictyophara pallida Don. (Pyrilla perpusilla Walker) in Mysore—By M. APPANNA, S. USMAN AND K. S. SHIVASHANKARA SASTRI</i> ..	19
<i>Oil-Yielding Trees of Mysore—1. Neem and Its Uses—By K. GOPALA IYENGAR AND K. S. KRISHNA SASTRI</i> ..	27
<i>A Note on Paddy Cultivation in Government Experimental Farm, Babbur, and Surroundings—By H. A. ABDUR RUBB</i>	32

SELECTED ARTICLE

<i>Graft Mulberry—By H. S. VENKATA RAO</i>	36
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EXTRACTS AND SELECTIONS

<i>Plantation Hygiene and Rhinoceros Beetle</i>	40
<i>Cauliflower Growing</i>	42
<i>Cauliflower and Boron Deficiency</i>	45
<i>Litchi</i>	45

RESEARCH NOTES AND NEWS

<i>Vaccination Against Ranikhet Disease in Poultry</i> ..	47
<i>Fowl Typhoid</i>	48
<i>Tobacco Research in India</i>	49
<i>First Woman Scientist</i>	51

UNION ACTIVITIES AND SECRETARY'S SECTION

<i>Addresses Presented to Dr. L. C. Coleman</i>	52
<i>The Mysore Agricultural and Experimental Union Since 1934 To-date</i>	60

CORRESPONDENCE

<i>Observations on the Duration of Time Taken by Crop Plants from Flowering to Maturity—By D. VENKATARAMANIAH</i>	65
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Sri. S. V. Venkatarayan

EDITORIAL

Dr. L. C. Coleman's Visit

AN event of great importance and happiness to the Mysore farmers and the Department of Agriculture was the re-visit to the State of Dr. Leslie C. Coleman after a lapse of nearly 20 years. He arrived from Canada by air on 19-11-1953 at the Hindusthan Airport and was welcomed by a large body of his friends, co-workers and admirers including Sir M. N. Krishna Rao, all the *ex*-Directors of Agriculture of the State except one, the present and past heads of scientific sections, the Vice-President and other office-bearers of the M.A. & E. Union.

Dr. Coleman was the guest of the Government of Mysore throughout his stay in the State. After a series of discussions with Departmental officers and others he set out on an intensive tour of the State including Bellary, to study for himself how agriculture had progressed during the last two decades since he left Mysore in 1934 after a strenuous period of 28 years of hard work and service, first as Mycologist and Entomologist and later as the first Director of Agriculture in the State.

To a large body of raiyats of Mysore—particularly in the *malnad*, the Agricultural Department is more affectionately known as Coleman's Department. It was therefore no surprise that wherever he went he was greeted and received with warmth, affection and gratitude. He mixed freely with the farmers in their homes and fields, partook cheerfully of whatever frugal repast was offered to him, and made enquiries about their occupation, their health and well-being. He toured over 60 taluks and made detailed studies of the activities of the several Development Departments.

At the request of the Government, he has, it is learnt, submitted a 70-page report of his findings, suggestions and recommendations.

He left for Bombay *en route* to Canada on 23rd March 1954.

Dr. Coleman is 76 but is still at work. After leaving Mysore in 1934 he became Professor of Cytogenetics in the University of Toronto. After retirement at the age of 70, he has been working on problems of plant cancer under the auspices of the National Cancer Institute of Canada of which he is still a

Fellow. He took special leave of 4 months to re-visit his "second homeland" of Mysore (in his own words) and by the time this appears in print he will have been back at work.

Dr. Coleman has lost none of his vigour—either physical or mental. He still gets up at 4 a.m., walks 10 miles at a stretch as of yore and puts in 14 hours of work a day. He has lost none of his charm, drive and perspicuity. He has little use for microphones even when addressing huge audience as his stentorian voice can carry his words to the last bench or row.

It was indeed an heartening and refreshing experience to all those who saw Dr. Coleman during his recent visit. He still hopes to visit us again when he is 85. May he live long to fulfil his and our ambition.

It is proposed to bring out a special number of this Journal in September to record the life and work of Dr. L. C. Coleman.

Sesquicentenary of the Royal Horticultural Society

Like great rivers or great men the origins of many great institutions are either obscure or lowly. On March 7, 1804, 150 years ago, the greatest horticultural society in the world was founded in the garret of a bookseller in Piccadilly—one Mr. Hatchard, "to collect every information respecting the culture and treatment of all plants and trees, as well culinary as ornamental, to foster and encourage every branch of horticulture and all the arts connected with it". From such small beginnings the Royal Horticultural Society has now grown into the biggest of its kind in the world with a membership of 45,399 Fellows, Associates, etc., an annual income of £ 1,31,323 or Rs. 17.50 lakhs and a general reserve fund of £ 5,72,836 or Rs. 76.38 lakhs. It owns and runs the unique and famous Wisley Gardens in Surrey with its own laboratory, herbarium, school rooms, and library. Its wild garden, rock garden, the Award of Garden Merit collection of plants, its Azaleas and pinetum, its floral collections and trials are world renowned.

Besides publishing the Society's journal and the famous *Curtis's Botanical Magazine*, besides arranging the great Chelsea and other fortnightly flower shows, it has sponsored several floral and vegetable trials and national fruit trials. It arranges for scientific exploration. The latest exploration it has sponsored along with the Natural History Section of the British Museum is to Nepal during April-November 1954. This team of five is

headed by the Botanist H. Williams and will stay in Dhavlagiri and Annapoorna and explore the hitherto untouched flora of the mountainous region.

The Society also runs a school at Wisley and conducts the examination for the coveted National Diploma in Horticulture. It awards a large number of medals and certificates for the best plants and varieties of horticultural importance.

It acted as host to the Thirteenth International Horticultural Congress in 1952 and published a two-volume report of the proceedings in the record time within an year of the opening of the Congress.

Its Lindley Library with over 20,000 volumes is the most comprehensive collection of botanical and horticultural literature in the world.

It is a moot question whether the Royal Horticultural Society has made England a land of gardens or whether the innate love of flowers and plants in the British race has made the R.H.S. the greatest horticultural society. A recent Gallup poll has shown that gardening is far and away the most popular recreation in England and that there are round about 20 million gardeners in Britain or one out of every two householders in that country garden for pleasure.

In U.S.A. also gardening is very popular though not to the same extent as in Britain. In 1951 a nationwide poll revealed that there were 17 million home gardeners in U.S.A. City gardeners outnumbered rural gardeners 2 to 1.

A nation that loves plants and animals is really sound at heart. In the India of the future at least, gardening and garden societies should always occupy a prominent place.

Shri S. V. Venkatarayan

Shri S. V. Venkatarayan, B.A., Plant Pathologist to the Government since 1943, retired from service on 2nd November 1953 after 35 years of devoted work. Born in 1898 he had his early education in Palghat and graduated from the Presidency College, Madras, at the early age of 20. Soon after, he joined the Mysore Department of Agriculture and learnt his work under such distinguished scientists as Dr. L. C. Coleman, Dr. M. K. Venkata Rao and Mr. M. J. Narasimhan. Shri Venkatarayan strove hard to deserve and shine in the mantle bequeathed

to the Mycology Section by these men. Quite early in his career he discovered the chlamydospores or vegetative resting spores in the areca *Koleroga* fungus—*Phytophthora arecæ* and established the identity of the Mysore strain with the Ceylon strain. His studies on the coffee *Koleroga* fungus—*Corticium Koleroga* revealed two new fern hosts. In 1931 he discovered the existence of *Plasmopora viticola* causing the downy mildew of grape vines.

As early as 1935 he carried out and published a detailed study of the biology of *Ganoderma lucidum* causing *anabe roga* of coconut and areca palms which in recent years is causing great concern in the arecanut and coconut regions of the State. He also evolved a simple and effective remedial technique for the control of the disease.

He discovered or identified many new diseases like *Phytophthora* rot of Tung leaves, *Sclerotium* rot of apple roots, *Schizophyllum* wood rot of apples, mosaic disease of ragi, etc., and he has a long list of publications and research notes to his credit.

Shri Venkatarayan struck one as painstaking, conservative and tenacious—precisely the qualities required of a systematist. It was in the field of systematics and nomenclature that he revelled and shone at his best.

He was a great believer in the virtues of that peerless fungicide—Bordeaux mixture and although he introduced the newer organic fungicides he never took to them very kindly. He was essentially a traditionalist rather than an innovator. He was conscientious and thorough in his work and has left behind him very sound traditions of research and scholarship in the field of Mycology. Although he richly deserves his well-earned rest, the country cannot afford to lose his services. Shri S. V. Venkatarayan is still young and well preserved and we do hope that he will continue to enrich his chosen field even after retirement and make further contributions to the principles and practice of plant protection in Mysore State.

DEVELOPMENT OF DAIRYING IN INDIA DURING THE FIRST HALF OF THE 20TH CENTURY

DR. T. M. PAUL*

FROM time immemorial, the cow has been recognised as the mother of prosperity and has literally been worshipped also for the same reason in India. Perhaps there was a time in pre-historic days, when the Indian cow was really a fountain of wealth and prosperity. But, subsequently the cow has been neglected for ages in India so much so, today we find ourselves in the pitiable position of owning nearly a third of the world population of cattle and yet unable to produce more than 5·4 oz. of milk per head of human population from this vast multitude of cattle. Gross negligence extending over not centuries but thousands of years, has led the country to this state of affairs. All the same, the situation is not so desperate; with proper planning and determined action both by the Government and the people, it is still possible to bring back the cow to the same old place as the mother of plenty and prosperity. In fact, the improvements achieved as a result of proper breeding, feeding and management of the *Sahiwal* herds of cows in different parts of India is a very encouraging sign of what could be achieved with our animals under organised dairying.

The introduction of cream separators into India in 1889 and the establishment of dairy farms in the country by the military authorities in 1891 may be said to have contributed largely to the development of organised dairying in India. Of these, the former has contributed, towards the development of creameries in the dairying tracts of India, though not to the same extent as in other countries. But the latter has helped commercial dairying in all its aspects. Since the military dairy farms were established with the definite purpose of supplying dairy produce for the British troops, they were more interested in producing more milk per animal in the shortest time, by introducing cross-breeding and very little attempt was made to improve the indigenous breeds. But these farms indirectly led to the creation of the post of Imperial Dairy Expert in 1920. This may well be called the corner-stone of organised dairying in

* Indian Dairy Research Institute, Bangalore.

India. The factors which directly led to the appointment of the Imperial Dairy Expert are the recommendations of the Board of Agriculture in 1913 and 1916. The Imperial Dairy Expert was appointed to supervise dairy instruction, to study and improve the existing methods of dairying in the country and to advise the State, Provincial and Central Governments and industry on improving the standards of production, handling, etc., of milk and milk products. The post of a Physiological Chemist was also created as a result of the recommendations of the Board of Agriculture to carry out investigations on the scientific feeding of dairy cattle. The other recommendation of the Board was the opening of schools at Poona and Lucknow for the training of dairy technicians, but this was not given effect to. However, this was also achieved in 1923 by the transfer of the military dairy farms at Karnal, Wellington and Bangalore for educational and breeding purposes as proposed by the Imperial Dairy Expert and later on supported by the Inchcape Committee. The headquarters of the Imperial Dairy Expert was then transferred to Bangalore, which was made the main educational and experimental centre by the upgrading of the existing dairy into the Imperial Institute of Animal Husbandry and Dairying. The other two farms at Wellington and Karnal were made its sub-stations to provide training to students in dairying and large-scale cultivation of fodders in a mixed farming system with the breeding of *Tharparkar* and *Hariana* cows. Facilities for training in creamery methods were added by the transfer of the Anand Creamery to the control of the Imperial Dairy Expert as another sub-station of the Imperial Institute of Animal Husbandry and Dairying. The Physiological Chemist's section which was attached to the Agricultural Institute at Pusa was also transferred to Bangalore to complete the educational and research facilities at Bangalore. This may well be called the beginning of dairy development in India in the spheres of education, research and industry. The achievements in these three directions obtained during the first half of the present century are discussed below.

DAIRY EDUCATION

When the Imperial Institute of Animal Husbandry and Dairying was established in Bangalore in 1923 the Government of India instituted a two years' training course leading to the award of the Indian Dairy Diploma on the same lines as the National Dairy Diploma of England. Simultaneously the same course was also started at the Agricultural Institute, Allahabad.

Due to want of adequate facilities only one batch of students was given training at a time. So, new admissions were made only once in two years at each of the two centres. Although numerous applications were received, only 16 students were admitted in the first batch, but in later years upto about 30 students were admitted in Bangalore, while Allahabad Institute continued to admit smaller numbers. Two other courses were also started at Bangalore ; (i) a Post-Graduate course to impart higher training in the science and practice of dairying to agriculture and veterinary graduates ; and (ii) a short practical course to benefit the men in the industry. Usually, less than 10 students (21 in one year and 18 in another year) took the Post-Graduate course every year till it was replaced in 1949 by the Honorary Research Workers' course which was started as early as 1945 in addition to the Post-Graduate course. Short courses of different durations in any particular branch of dairying were also arranged for individuals and batches of people at any time of the year. Upto 122 army personnel have been given vocational training at a time. During the post-war reconstruction period, more of trained personnel were needed in dairying and hence the Government of India increased the facilities at Bangalore and about 35 students were admitted every year for the I.D.D. course. Simultaneously the number of students admitted were increased at the Allahabad Institute also. Altogether upto the end of 1950, 1,479 candidates have taken training in different courses at the Bangalore Institute and Allahabad Institute together. Of these, 715 were admitted to the I.D.D. course, 446 to the regular short course, 144 to other short courses, 161 took Post-Graduate training and 13 were admitted as honorary research workers for M.Sc. Degrees of different Universities. The contribution of Allahabad Institute in this connection is the training of 290 students for the Indian Dairy Diploma, all the rest being trained at Bangalore. The Indian Dairy Research Institute at Bangalore, although started for the purpose of imparting dairy education and training for students from all over India, happens to be the only institution of its kind in the Far East. Students from Ceylon, Burma and Malaya have come and taken training at the Institute in modern methods of dairying.

DAIRY RESEARCH

The establishment of the Imperial Institute of Animal Husbandry and Dairying at Bangalore in 1923 as a training centre focussed the attention of the public as well as the Government

on the importance of dairying. Although the facilities at the Institute were limited, attempts were occasionally made at the Institute to study some of the important problems confronting the dairy industry of the country. Sporadic attempts were made in other places also in improving the quality and quantity of the milk and milk products produced in the country. Gradually the need for a Central Dairy Research Institute with enough staff and adequate facilities was felt and in 1937 the Government of India invited Dr. N. C. Wright, Director of Hannah Dairy Research Institute, to study at first hand the condition of the Dairy Industry in India and recommend measures for the general improvement of cattle and dairy industries of India. One of his recommendations was the establishment of a well-equipped Dairy Research Institute at a central place. This was approved by the Government of India and the late Dr. Davies was appointed Director of Dairy Research in 1939. Dr. Davies toured the whole of India and finally selected a place near Delhi for the location of the Dairy Research Institute, but the building up of the Institute was delayed due to the outbreak of war. Meanwhile, unfortunately Dr. Davies passed away, and consequent on the appointment of Dr. Zal R. Kothavalla to succeed Dr. Davies as Director of Dairy Research, the Dairy Chemistry and Dairy Bacteriology sections started by Dr. Davies at the Imperial Agricultural Research Institute were then transferred to Bangalore. The Imperial Dairy Institute at Bangalore was renamed as Imperial Dairy Research Institute. The location of the Central Dairy Research Institute being undecided, no permanent buildings were put up at Bangalore and the Institute Laboratories have all along been housed in temporary structures. However, during the post-war period in 1945-46 when Dr. K. C. Sen succeeded Dr. Kothavalla as Director of Dairy Research some additional staff were appointed and the section of Dairy Technology was added to complete the four sections. At the same time, Prof. H. D. Kay, Director, National Institute of Research in Dairying, Reading, was invited to make recommendations on the reorganisation of dairy education and research in the country. His recommendations regarding the location of the Institute near Delhi and starting of a Dairy Science College, etc., are yet to be implemented.

While the proposals for the location of the new Institute at Delhi with specialist staff and adequate equipment were going on the nucleus staff already appointed in 1941 and those added in 1946 have been studying the problems facing the

dairy industry of the country. Quite a number of publications have come out from the Indian Dairy Research Institute in different journals in India and abroad. This has given a stimulus to research work in dairy science in different parts of the country and the need for a journal devoted entirely to dairy science was keenly felt. At the initiative of Dr. K. C. Sen and other research workers in the field, the Indian Dairy Science Association was formed in 1949 with the publication of the *Indian Journal of Dairy Science* as one of the main objects. Prompt publication of research work in dairy science in this journal has further stimulated dairy research in India. Up to the end of 1950, nearly 200 papers have been published by Indian workers in the field of dairy husbandry, in the different journals in India and abroad. In the field of dairy chemistry, a greater number of publications (about 250) have appeared during this period while nearly 60 papers have appeared in Dairy Bacteriology and about 50 papers in Dairy Technology during this period. Study on milk substitutes has also attracted considerable attention resulting in the publication of about 30 papers in this line. Reports and Reviews have contributed about 50 papers. Thus during the first half of the 20th century over 500 publications have been made by Indian workers in the field of Dairy Science. Considering the limited facilities that were available, one would admit that this is a good account. But this is only a beginning and much remains to be done, and more than all that, the results of research have to be carried to the doors of dairymen in the villages.

DAIRY INDUSTRY

The origin of organised dairying as an industry in India can be traced to the end of the 19th century when the cream separator was introduced into the country. Cream separators have directly helped the establishment of butter industry in some of the dairy tracts of India like Gujerat, United Provinces, etc. The skim milk which forms a by-product of the butter industry has been utilised for casein manufacture in many parts of the country. Cream separators are becoming more and more popular in India, but their number in use in India is still much smaller than in other countries. Another factor which directly helped the development of organised dairying in India is the establishment of large-scale dairy farms by the Defence Department for the supply of milk and milk products to British troops and military hospitals. For the first time in India, these farms

demonstrated how dairy business can be run on scientific and at the same time profitable lines. This has encouraged private individuals to start dairy farms on their own initiative, to supply milk to hospitals and other institutions and even individual customers. Wherever the Defence Department did not have their own farms they used to buy milk from the open market. This system gave rise to milk contractors who used to buy milk from the villages and supply it to the Defence Department. In fact, this has been the starting point of the numerous co-operative milk unions in the country. The encouragement and help given by the State Governments in the starting and running of these co-operative unions have given very encouraging results and today we have over 200 of them functioning in different parts of the country.

By far the greatest encouragement given to Dairy Industry by different State Governments is in the matter of starting of city milk supply schemes which are in progress in the different large cities of India. Of these, the ambitious project of Bombay, the Aarey Colony, deserves special mention. Milk supply schemes for other cities in India have been and are being planned to solve the milk problem in their respective areas.

Toned milk and reconstituted milk are two other aspects of Dairy Industry which have found Government support. The States of Bombay and Madras have been encouraging the sale of toned and reconstituted milk on a large scale. In Bombay, buffalo milk is toned down by reconstituted skim milk prepared from imported skim milk powder, while in Madras imported skim milk powder is reconstituted into whole milk by incorporating some vegetable oil. In times of milk shortage and when milk price is high, these aspects of dairy industry make the existing supply of milk go round a little further and at a cheaper rate. Hence this kind of toning and reconstitution deserve encouragement.

The Defence Department of the Government of India has also directly encouraged the ghee industry by way of purchasing large quantities of ghee in the open market and refining it in their ghee-heating centres for the use of Indian troops.

Private enterprise also had its share in promoting dairy industry and other related industries in India during the last 50 years. Besides the small and medium farms started and managed by private individuals in different parts of the coun-

try, concerns like M/s. Polsons, Ltd., M/s. Edward Keventers, Ltd., etc., have been in the field of the dairy industry for a long time, dealing in dairy appliances and promoting the interests of dairy industry in general.

Compared to the past, the first half of the 20th century has seen considerable progress in dairying in India. While one does not minimise these achievements, this need not lull us into any false sense of complacency regarding the future. Only the fringe of the problem has been touched so far, and quite a lot remains to be achieved. Let us hope, the coming decades will put India on the map of the dairying countries of the world.

A NOTE ON THE BIOLOGY AND HABITS OF *RICANIA FENESTRATA* FABRICIUS, A NEW PEST ON JASMINE

DR. M. PUTTARUDRIAH AND B. M. MAHESWARIAH*

INTRODUCTION

JASMINE (*Jasminum flexile*, Vahl.—Var. *travancorensis*) is an extensively grown flowering ornamental plant both in backyards and in flower gardens for its economically important flowers. It is comparatively free from the attack of many insect pests. But in recent years *Ricania fenestrata* Fabricius (Ricaniidæ, Hemiptera) was noted to assume serious proportion on this plant around Bangalore.

HOST RANGE

Distant and Green (1906) collected specimens of *Ricania fenestrata* in Trivandrum, Ceylon, Kandy and Peradeniya. Hutson (1919) reported it as one of the minor pests of tea in Ceylon. Light (1929) noted its occurrence on tea along with *R. speculum*, Walk, in Ceylon. Beeson (1941) has quoted from the work of Chatterjee and Bose that this insect occurs in South India on the forest plants like *Canthium didymum*, *Santalum album* and *Zizyphus cænoplia*. During the summer months of 1952 and 1953 the writers noted it in pest form on Jasmine (*Jasminum flexile* Vahl.) around Bangalore for the first time in South India. They also observed it occasionally on other garden and vegetable plants like *Aganosoma dichotoma*, *Jasminum auriculatum*, *Erythrina indica*, *Citrus decumana*, *Rosa centifolia*, *Dahlia variabilis*, *Canna indica*, *Solanum melongana*, *Lycopersicum esculentum*, etc., particularly when they are closely situated to Jasmine.

NATURE OF DAMAGE

As the adults have the habit of inserting their eggs within the tissues of tender stems and leaf midribs by making slits with their ovipositors, the tender portions wither away. Large

* Division of Entomology, Dept. of Agriculture, Bangalore.

number of nymphs of all instars and adults cluster around twigs and leaves and suck the sap of the plant causing disfiguration and later dying up of those parts. In case of severe infestation the entire plant suffers and dries up.

LIFE-HISTORY

Eggs.—The adult female selects suitable places on tender shoots, petioles of leaves and midribs of leaflets and inserts the eggs within the tissue. The eggs are deposited individually in linear slits made by the ovipositor. These slits are commonly in a single row and frequently in more than one row, and the eggs are about 0.5 mm. apart from each other. Each egg is covered by a frothy mass and white hairy structures which indicate the position of the eggs. The number of eggs in a row varies from 4 to 26. They are found deep in the tissue of tender parts and more superficially in the tissue of harder twigs.

The egg is oval, creamy white and smooth with a soft chorion. Size is small, the average length being 0.63 mm. and width 0.30 mm. The incubation period lasts for 23 days in the months of May to June.

Nymph.—The newly-hatched nymph is tiny, measuring about 0.68 mm. in length and 0.35 mm. in breadth at the widest region. It is pale green in colour with two cottony anal brushes. It is very active, wingless and jumps when disturbed. Large number of nymphs congregate and suck the sap of the plant. Prior to moulting, the nymph is seen to be dull and lethargic and soon regains activity after moulting. Each nymph normally moults five times before attaining the adult stage. The fifth instar nymph casts its skin and forms the adult. A large number of white cast skins can be observed on and under the infested plants. The duration of the first instar lasts from 5-9 days. In the second instar it grows bigger in size and the period lasts from 5-6 days. The third instar lasts from 6-7 days, the fourth 8-11 days and the fifth from 13-16 days. The fifth instar nymph soon after the fourth moult measures 4 mm. long and 3 mm. wide. The size increases in each instar. The wing pads appear in the third instar and the wings are fully formed after the fifth moult and the adult formation is completed. The anal white hairy structures appear like a fan bent over the body of the nymphs and completely cover them. It is only when disturbed, the fanlike structure is bent backwards and the nymph jumps violently.

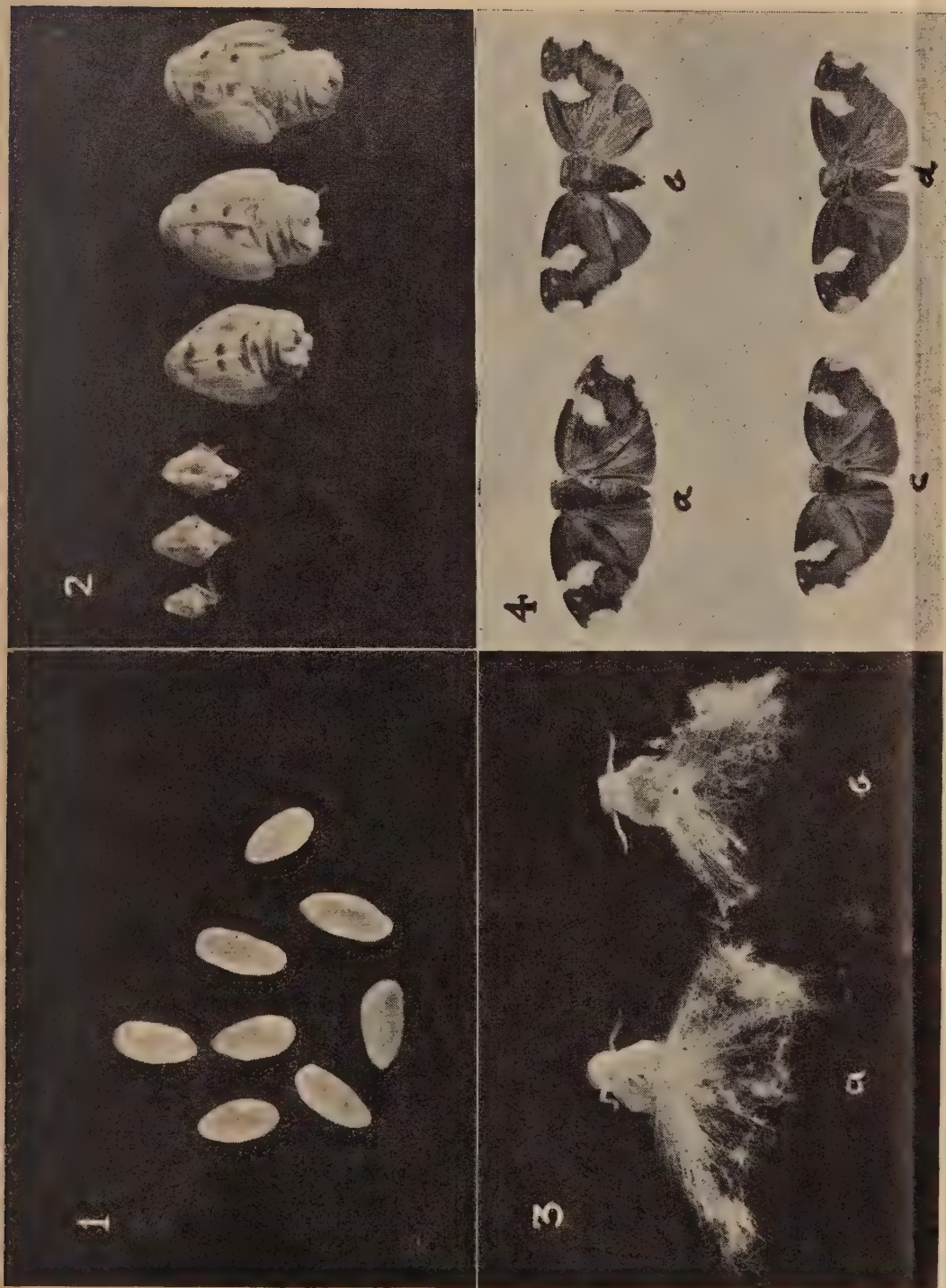
Under the room temperature ranging from 77° to 86° F. during the months of June-August, the nymphal stage lasts from 39-44 days and the life-period from the date of egg-laying to the date of formation of adult varies from 62-67 days in contrast to the quotation made by Beeson (1941) from the work of Chattarjee and Bose wherein it is stated that 'it moults four times and has a total life-cycle of 90-100 days, egg stage 21-23 days, first nymphal stage 17-20 days, second 17-18 days, third 18-20 days, fourth 19-20 days in South India'. Date of moulting and duration of the several instars are shown in the following table for a series of five individuals.

TABLE I

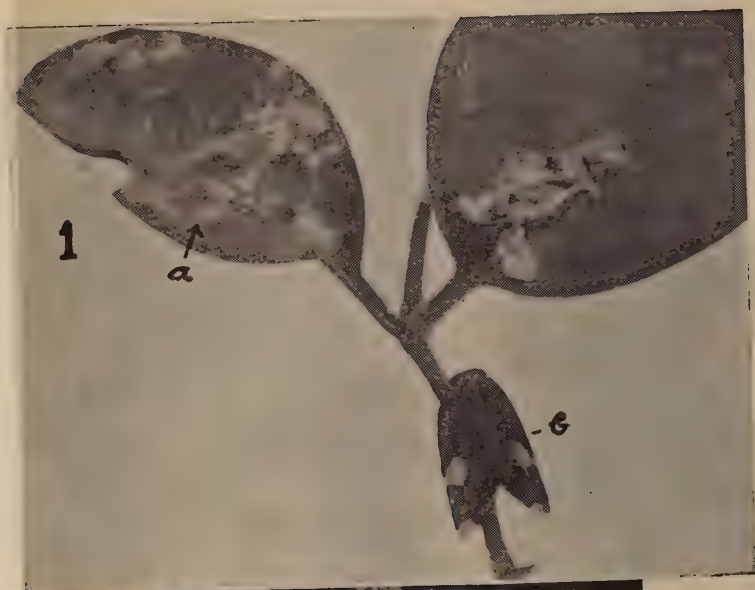
Date of moulting and duration of several instars

Sl. No.	Hatching and 1st Instar	1st Moul and 2nd Instar	2nd Moul and 3rd Instar	3rd Moul and 4th Instar	4th Moul and 5th Instar	5th Moul and Adult	Duration of Nymphal Stage
1	21-6-'52 (5)	26-6-'52 (6)	2-7-'52 (6)	8-7-'52 (8)	16-7-'52 (14)	30-7-'52	39 days
2	" (5)	" (6)	" (7)	9-7-'52 (8)	17-7-'52 (16)	2-8-'52	42 "
3	" (9)	30-6-'52 (5)	5-7-'52 (6)	11-7-'52 (10)	21-7-'52 (14)	4-8-'52	44 "
4	" (8)	29-6-'52 (6)	" (6)	" (11)	22-7-'52 (13)	"	44 "
5	" (7)	28-6-'52 (6)	4-7-'52 (6)	10-7-'52 (10)	20-7-'52 (13)	2-8-'52	42 "

Adult.—Newly-formed adult is blackish brown in colour, the body and wings being dark except for irregular semi-transparent patches on the wings, thus presenting a mottled appearance. Distant (1906) has described the adults. The female is a little larger in size than the male. On wing expansion the female measures 20.0 mm. and the male 18.00 mm. and from vertex to the tip of the abdomen the female measures 8.0 mm. and the male 7.0 mm. Adults are observed in the fields during March-September. Copulation takes place as in the case of moths, the ends of the abdomen being united with the heads of the two sexes in the opposite direction. Copulation generally takes place in the morning and lasts for more than 2 hours.



FIGS. 1-4. Different stages and cast skin of *Ricania fenestrata*: 1. Eggs—exposed and magnified; 2. Nymphs without anal tufts (anal tufts were shed immediately after the live nymphs were chloroformed); 3. Cast skin with anal tuft: *a*. Dorsal view, *b*. Ventral view; 4. Adults: *a*. Female—dorsal view, *b*. Female—ventral view, *c*. Male—dorsal view and *d*. Male—ventral view.



FIGS. 1-2. *Ricania fenestrata* on Jasmine: 1. A portion of an infested twig: *a*. Nymphs and cast skins on the leaf, *b*. Adult bug; 2 A row of eggs on the twig: *a*. Eggs in the tissue with covering on, *b*. Nymphs with anal tufts.

CONTROL

Natural Enemy.—Spiders were found to web around the infested parts and ensnare all stages of the insect and feed on them, thus checking the insect population to some extent.

Cultural.—Infested parts can be easily made out by the indications of egg slits. Such parts can be systematically pruned and burnt.

Chemical.—Dusting with 5 per cent. benzene hexachloride powder on nymphs and adults was found to be effective in controlling the pest.

SUMMARY

Ricania fenestrata has been noted for the first time as a pest of Jasmine in South India. Eggs are laid inserted in the tissues of twigs, petioles and midribs. Incubation lasts 23 days. The nymphs are whitish-green with fan-like white hairy structures at the tip of the body. They moult five times and the nymphal stage lasts 42.2 days on an average. The total life-cycle occupies 63-67 days.

The pest can be controlled by pruning the infested parts indicated by egg slits and burning them and also by dusting 5 per cent. BHC powder on the nymphs and adults.

ACKNOWLEDGEMENT

The insect was identified by the authorities of the Commonwealth Institute of Entomology, London, and the photographs were made by Sri. P. R. Raghuram Pillay, Artist, Department of Agriculture. The writers feel grateful to them and to Sri. B. Krishnamurti, Government Entomologist, for kindly affording facilities and encouragement.

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GROUNDNUT BREEDING IN MYSORE

Review of Progress

K. GOPALA IYENGAR*

INTRODUCTION

GROUNDNUT is an important oilseed grown in the State. It occupies an area of nearly 3 lakhs of acres and the estimated production amounts to 40-45 thousand tons. Consequent to the inclusion of the major portion of Bellary into Mysore, the area will further expand to probably 5 lakhs of acres. The Department of Agriculture in Mysore was the first in India to start intensive breeding work on this crop. From 1913 onwards, the late Dr. V. K. Badami was active in effecting improvements to this, and was able to release an improved variety H. G. 1 for general cultivation. Till very recently this variety was also in favour, beyond the borders of Mysore. Selection and hybridization resulted in the accumulation of a wealth of material which required critical evaluation. Since 1938 when Dr. Badami severed his connection with the Department, the author of the present review was in part-time charge of these investigations. Subsequent work resulted in the release of another improved variety, H. G. 3. The Indian Council of Agricultural Research partly financed investigations on this crop from 1944 onwards. Later, the Indian Central Oilseeds Committee stepped in and continued financial assistance till 1952.

Bulk of the work reviewed here was carried out on Hebbal Farm near Bangalore. A few small-scale bulk trials were carried out on the Visvesvaraya Canal Farm, near Mandya.

SPREADING GROUNDNUTS

This type of groundnut is extensively cultivated in the districts of Tumkur and Kolar. Smaller areas are found in Bangalore, Mandya and Mysore. The original type under cultivation was a long-duration variety known as Mysore Local. As soon as the crop began to be of commercial importance, this was replaced by Mauritius, a prolific, shorter duration, type. A selection of Mauritius under the name Sugatur was distributed

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to some extent in Kolar, Tumkur and Bangalore. This variety is still in cultivation though to a very limited extent. Mauritius was subsequently displaced by new types like Pondicherry and Senegal, which bore larger and many 3-seeded pods. Some quantities of Virginia and Big Japan were released by the Department. These are closely akin to Pondicherry and Senegal.

Field trials conducted during 1944-53 comprised the following improved varieties—A. 2, B. 1 and D. 3 of Punjab, A.H. 113, A.H. 186, A.H. 477, A.H. 685, T.M.V. 1, T.M.V. 3 and T.M.V. 4 of Madras, Pondicherry 8 of Bombay, T. 26 of U.P. and Hebbal 6, Korategere 4, Korategere 5, and Kyathasandra 1 of Mysore—16 selections of Barbados, Bassi, Big Japan, Carolina, Mauritius, Nigeria, Pondicherry, Sugatoor, Transvaal and Virginia—and 15 segregates from crosses. T.M.V. 3 and a local selection from Barbados now named as H.G. 7 have emerged as very desirable from these trials. T.M.V. 3 proved significantly superior to T.M.V. 1, the standard variety of Madras in 4 seasons out of 8, and H.G. 7 during the rest of the time. T.M.V. 3 is a very late variety and bears medium-sized pods, most of which are 2-seeded. H.G. 7 while slightly lower in yield, bears larger pods, many of which are 3-seeded. It is earlier than T.M.V. 3 by a week to 10 days. H.G. 7 is under bulk multiplication at present.

BUNCH EARLY GROUNDNUTS

These were comparatively late arrivals to the State. Their introduction to this country was chiefly due to the efforts of the Government of Bombay. After the termination of the First World War, the area under them began to expand steadily till they covered nearly half the area under the crop in Mysore. Chitaldrug District exclusively raises this type, popular varieties of which are Spanish and Small Japan. Shimoga, Hassan and Chikmagalur grow only these early bunch varieties. They have no appreciable foothold in either Tumkur or Kolar but compete with spreading growths in other parts of the State.

Field trials included T.M.V. 2 of Madras, Spanish 5 of Bombay, H.G. 3 of Mysore, A.K. 12-24 of M.P. and B. 238, B. 239, Barberton and Manyema of Africa—selections of African White, Small Japan and Spanish, 10 in number—and 10 hybrids. A selection of Small Japan named as H.G. 8 and a cross between Spanish and Small Japan (G. 0553) now called as H.G. 9 have done very well in these trials. Both of them are under bulk

multiplication and a small quantity of H.G. 8 has been released for trial in Chitaldrug District.

BUNCH LATE GROUNDNUTS

This type mostly found in Bangalore District is of no commercial significance. The improved variety H.G. 1 belongs to this class. Trials at Hebbal included along with H.G. 1, the following varieties, T. 18, T. 23 and T. 24 of U.P., Big Japan of Kashmir, one erect mutant each from A. 2, and Big Japan, Satara Grey of Bombay, and Castle Cary, Kalandi, Luvalala, Maritunde, Migongo and Samaru 38 from various parts of Africa—4 selections of African Red, Kalandi and Bunch Virginia—and 62 hybrids. Two segregates of a cross between Tennessee White and Valencia, G. 0577 and G. 0620 have been outstanding in these trials. They have been renamed as H.G. 10 and H.G. 11. They are under multiplication and when released are expected to easily replace H.G. 1.

CONCLUSION

Characters of the improved varieties evolved are briefly mentioned below :

Variety	Habit	Duration in months	Yield of pods lb. per acre	Shelling %	No. of seeds per kg.	Oil %	Colour of seed
T.M.V. 3	Spreading	5	624	73	2575	49	Rose
H.G. 7	"	4 $\frac{1}{2}$	547	74	2908	50	"
T.M.V. 1 (Control)	"	4 $\frac{3}{4}$	500	72	2564	50	"
H.G. 8	Bunch	4	558	79	2834	50	Red
H.G. 9	"	4	539	78	3068	49	Rose
Spanish (Control)	"	4	441	74	3537	48	"
H.G. 10	"	4 $\frac{3}{4}$	887	74	1909	49	"
H.G. 11	"	4 $\frac{3}{4}$	867	72	1857	50	"
H.G. 1	"	4 $\frac{3}{4}$	674	72	2366	49	"

A NOTE ON THE CHANGE IN THE STATUS
OF THE SUGARCANE LEAF-HOPPER
DICTYOPHARA PALLIDA (DON.)
(*PYRILLA PERPUSILLA* WALKER)
IN MYSORE

M. APPANNA, S. USMAN AND K. S. SHIVASHANKARA SASTRY*

INTRODUCTION

THE appearance in 1951 in the Visvesvaraya Canal Tract, Mandya District, of the Sugarcane leaf-hopper, *Dictyophara pallida* (Don.) (Hemiptera, Lophopidae) has aroused considerable interest in this very destructive insect, and in order to furnish the available information concerning it, the present paper has been prepared.

There can be no question that the sugarcane leaf-hopper is a most serious setback to the successful cultivation of cane in the State where it is well established. Since the beginning of the present century this pest is appearing from time to time in destructive numbers in North India—Uttar Pradesh, Madhya Pradesh, Bihar and Punjab, and more recently in the Southern States of Madras and Hyderabad. Its establishment in the Visvesvaraya Canal Tract, if permitted, will be most undesirable to the sugarcane interests in Mysore State. In view of the very serious character of the pest, it is most urgent that all possible steps should be taken to nip it in the bud, so as to prevent its further multiplication and spread.

ECONOMIC HISTORY AND DISTRIBUTION

Walker originally described the species under the name *Zamila perpusilla* from a specimen from North Bengal (Distant, 1906). In 1900 it was for the first time reported as a pest of sugarcane in North Arcot District, Madras State, and was identified as *Dictyophara pallida* Don. (Stebbing, 1903). It was subsequently observed on sugarcane by Niceville at Cawnpore (Stebbing, 1903). In the year 1907, Kirkaldy, however, pointed out the identity of the insect as *Pyrilla aberrans* Kirby. (Misra, 1917). Misra (1917) records from Pusa (Bihar) that it attracted attention as a pest of cane early in 1905 and that in the

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subsequent years it became a very serious pest there. He also gives the distribution of this insect as North-West India, including North-West Frontier Province and the Punjab (now parts of Pakistan), Uttar Pradesh, Madhya Pradesh, Bihar and Bombay. Though reported as long ago as 1900, Ayyar (1940) states that only from about 1940 this insect assumed a serious form in the Madras State. According to Sen (1948) *Dictyophara* is generally a minor pest in Bihar but recently it occurred in a serious, though sporadic, form in some cane-growing areas. *Dictyophara* is also recorded from Burma (Misra, 1917) and Ceylon (Pruthi, 1937). Thus it will be seen that *Dictyophara* is distributed practically throughout India, and that in all regions of its occurrence, it was present in negligible numbers in the beginning and then assumed a serious form.

The history of this insect in Mysore is in no way different. It was first recorded by Distant (1916) from Chickballapur, Kolar District. Specimens in our Entomological collection were collected by Sri. T. V. Subramaniam on Sugarcane in Mandya in 1937 and later by one of us (S. Usman) on cane in Bangalore in 1948 and again in 1950. But it was in August-November 1951 that for the first time in Visvesvaraya Canal Tract, *Dictyophara* was found in appreciable numbers, as many as 5-6 individuals being present on each plant, when it was observed regularly to breed generation after generation on sugarcane. However, there was a definite decrease in numbers of *Dictyophara* in 1952, which was mainly due to the lack of continuous crop in the summer (*opige*) season, and also partly due to the control measures adopted in 1951. Again, the pest has reappeared in 1953 in a mild form. *Dictyophara* is also found breeding, though in small numbers, on jola (Juar) seedlings in Bangalore. It will be evident, therefore, that prior to 1951, *Dictyophara* was present as a casual insect, and that only from August 1951, it appears to be assuming the status of a pest, though in a mild form. The reason for the change in the status of this insect is not far to seek. It was breeding in small numbers, all along unnoticed, because of the imperceptible damage in the beginning, and as soon as conditions—ecological and physiological—in some localities in the Visvesvaraya Canal Tract in particular seasons, became more favourable to its development, *Dictyophara* increased rapidly, at last touching the economic level. During the year 1951 continued draught conditions prevailed in the sugarcane tract, and hoppers in more than usual numbers were seen along with the sugarcane mealybug, *Sacharicoccus sachari* Ckll. Misra

(1917) points out that the broad-leaved succulent varieties of cane are preferred by *Dictyophara*, and it is common knowledge that many such new varieties have recently been introduced into the Visvesvaraya Canal Tract. Further, recent observations have shown† that the application of nitrogenous manures to plants promote the development of *Dictyophara* pest and such manures are being used in large quantities in the sugarcane tract. Both climatic and host conditions must have, therefore, been favourable to the gradual multiplication of *Dictyophara* in Mysore.

NATURE AND EXTENT OF DAMAGE

Both the nymphs and adult hoppers suck up the plant sap from the leaves, but most of the damage is in the nymphal stage. In the majority of cases the hoppers prefer to feed on the lower surface of leaves and especially near the bases of leaves near the midribs. If, therefore, the infested leaves were to be held up against the light, they would be found to contain a large number of punctures with yellowish circles around them. It is the coalescence of such spots that imparts yellowish colour to the leaves which look pale and seared. Further, the hoppers exude honey-dew which, falling on the leaves below, gives rise to the growth of a black fungus. The general result is that the growth of plants is retarded considerably and they look old and seared prematurely. The crop, surviving a virulent attack of the hoppers, is poor both in quantity and quality.

However, it may be mentioned here that the incidence of the pest and the extent of the damage by it, has never reached the same intensity as reported from sugarcane areas in North India. During 1951, when the pest was present at its maximum intensity it was found all over the sugarcane tract but was more numerous in certain localised patches where on an average 5-6 individuals per plant were observed.

FOOD PLANTS

In Mysore, *Dictyophara* attacks in order of preference sugarcane, Jola (Jowar) and an unidentified broad-leaved succulent grass.

Misra (1917) records the following additional hosts : Oats (*Avena sativa*), Wheat, Guinea grass, *Pennisetum typhoideum* and *Saccharum spontaneum*.

† Unpublished reports of the Indian Central Sugarcane Committee.

LIFE-HISTORY AND HABITS

The Adult.—(11 to 14·5 mm.) pale tawny yellow with a thick cylindrical drawn out rostrum. Though a bug, it is popularly known as a leaf-hopper on account of its peculiar jumping habit both in the adult and nymphal stages.

Soon after transforming, the adult hoppers move about actively on the leaves on both the surfaces and jump about from leaf to leaf, more particularly in the sun. The males are more active than the females. They also prefer to feed on the lower surface of the leaves, mostly near the midrib, and exude honey-dew. They copulate freely; copulation takes place end to end, and the pair may remain *in copula* for nearly two hours, after which the female hopper begins to lay eggs.

The male is smaller than the female hopper (12 mm. and 14 mm. respectively) and has no pair of pads bearing bundles of cretaceous threads at its anal end. The males and females are in the proportion of 4 : 5.

Egg.—(0·9 mm.) oval, smooth, greenish at first changing to brownish yellow; two red spots appear laterally, being the eyes of developing embryo within.

Eggs are usually laid on the ventral side of the leaf-blades along the midrib in clusters and covered over by waxy threads secreted by the mother. The number in each cluster ranges from 4 to 54, the average being 31. Incubation period, 8-9 days.

Nymph.—Just hatched nymph is 0·9 mm., milk-white with dark red eyes; anal filamentous threads appear only later. Gradually the size increases (7 mm.), wing pads appear, and eyes change to pale green and the general colour becomes pale brown dorsally and pale orange ventrally; with the successive moults, the anal appendages also grow in size and attain a length almost double the size of the body. There are five instars, and the total development occupies about 32 days.

Nymphs hatch on the same day from the eggs in a single cluster. The white, squarely built small nymphs, possessing the characteristic two anal appendages remain gregarious for some time and then disperse. The nymphs usually feed on tender sugarcane leaves generally on the ventral surface along the midrib, the feeding spots becoming yellowish white. They exude droplets of honey-dew, which give rise to the growth of a black fungus.

Moulting takes place by the rupture of the skin on the dorsal surface in a longitudinal axis of the body. The moulting is complete, and the exuvium remains on the leaf-surface on which the nymph rests prior to moulting. The nymph, immediately after moult, remains inactive for a short interval, and then commences to move about. The full-grown nymph is very active and in the field is seen hiding at the base of the leaf-sheath.

SEASONAL HISTORY AND NUMBER OF GENERATIONS

The total life-history occupies on an average about 45 days, which may be greatly prolonged during winter. Egg: 8-9 days; Nymph (5 instars): 32-40 days. The egg-laying begins from March-April and lasts till December and there are 4-5 overlapping generations during the year. The hopper attains its greatest development during July-November, and then damages the growing cane,

NATURAL ENEMIES

(a) Parasites

Egg Parasites.—*Tetrastichus pyrrillæ* Crawford (Hymenoptera, Eulophidæ) and two species of Encyrtidæ (specific determination awaited) play an important part in effectively checking the pest. All the parasites heavily parasitize the host egg-masses as the latter are laid prominently on the leaves. Observations on the degree of parasitisation under field conditions were made in the Visvesvaraya Canal Tract and it was found that it ranged between 14.2 to 100 per cent. The parasites appear in August and gradually increase in numbers, reaching their maximum activity in November, during which month practically every egg-cluster, and almost each egg in the cluster, is parasitized.

(ii) *Nymphal Parasites.*—*Dryinus pyrrillæ* Kieffer (Hymenoptera, Dryinidæ) was found to parasitise the nymphs of *Dictyophara*. Collections made at random in the Visvesvaraya Canal Tract during November-December revealed that 11.1 to 20 per cent. nymphs then present on the leaves were parasitised. However, the number of nymphs examined was small and more observations are necessary to establish the extent of parasitisation of nymphs.

(b) *Predators*

No effective predators were met with, although certain species of common ants and dragon flies, lizards and frogs were found attacking the nymphs.

CONTROL MEASURES

Various measures have been suggested for the control of *Dictyophara*. Misra (1917) recommends collection of egg-masses, encouragement of natural parasites, bagging of adults and spraying with crude oil emulsion and sanitary fluid. Rahman (1942) finds that stripping of dry leaves would check *Dictyophara* infestation. Sadik and Singh (1942) regard bagging the adults and nymphs by means of hand-nets as a cheap and efficient method of control. Sen (1948) records significant results with the conservation of natural parasite population by re-releasing *Tetrastichus pyrrilla* Crawford, in the fields. More recently insecticidal trials conducted in Uttar Pradesh, Bihar, Punjab and Madras have proved the efficacy of BHC and DDT against *Dictyophara*, and those chemicals are now finally recommended for the control of the pest. (*Annual Report of the Indian Sugarcane Committee for the year 1950-51.*)

Our tests—both in the Laboratory and in the small-scale field trials—show that a spray with 0.05 per cent. of DDT Guesarol 550 (a Geigy product), i.e., 1 lb. in 400 gallons of water, or (ii) dusting of 5 per cent. BHC (e.g., Gammexane D.025, Imperial Chemical Industries product) diluted with fine dry wood ash (1 : 2) was effective against *Dictyophara*, both nymphs and adults; the chemicals had no ovicidal action, but the nymphs or parasites which emerged out of the treated host egg-masses were killed. While the adverse effect on the emerging parasites is certainly undesirable, the efficient control of the pest obtained by the use of these potent insecticides should be exploited to the full advantage. In fact, during 1951, large-scale field dusting with Gammexane D.025 was employed to check the spread of the pest from the highly infected patches to the surrounding areas.

SUMMARY

The sugarcane leaf-hopper, *Dictyophara pallida*, which occurred as a casual insect, has, since 1951, established itself as a pest of sugarcane in the Visvesvaraya Canal Tract, Mandya District. However, it still occurs in a mild form. Both climatic and host



1 Sugarcane infested by *Pyrrilla*: *a*. Adult, *b*. Nymphs, *c*. Eggs (Exposed).
 2. Eggs (Exposed and enlarged). 3. Nymph (Enlarged). 4. Adult (Enlarged).

conditions seem to have been favourable to its establishment and rapid increase resulting in the change in the status of this insect in Mysore. In view of the very serious character of the pest in North India, it is most urgent that effective steps should be taken to check it in the initial stage and prevent its further multiplication and spread.

Both the nymphs and adult hoppers suck up the plant sap from the leaves, and the result is that the growth of the plant is retarded. In Mysore, *D. pallida* attacks in order of preference, Sugarcane, Jola (Jowar) and an unidentified grass.

The different stages of the sugarcane leaf-hopper and their habits have been studied. There are 5 nymphal instars. The average life-cycle occupies 45 days during March to December, during which period the insect breeds continuously and passes through 4-5 overlapping generations.

Tetrastichus pyrrillæ Crawford, and two Encyrtid parasites in the egg stage, and *Dryinus pyrrillæ* Kieffer, in the nymphal stage, have been obtained as natural parasites. There are no effective predators.

Spraying with a 0.05 per cent. DDT Guesarol 550 or dusting with 5 per cent. BHC (1 part in 2 parts of fine dry wood ash) are found effective against the pest, and should be employed with advantage, although their adverse action on the parasites is certainly undesirable.

ACKNOWLEDGEMENTS

The authors are grateful to Sri. B. Krishnamurti, Government Entomologist, and Dr. M. Puttarudriah, Joint Entomologist, for guidance and encouragement. Thanks are also due to Sri. P. R. Raghuram Pillai, Artist and Photographer, Department of Agriculture, Bangalore, for the diagrams.

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OIL YIELDING TREES OF MYSORE—1

NEEM AND ITS USES

K. GOPALA IYENGAR AND K. S. KRISHNA SASTRY*

THE present chronic shortage of fats and oils has revived interest in the greater utilisation of so-called minor oilseeds. Chief among them in Mysore are *Honge* (*Pongamia glabra*) and *Bevu* or *Neem* (*Azadirachta indica*). A more considerable use than at present of these oils and oilcakes in industry and agriculture is aimed at thus releasing in turn more edible oils for human consumption and oilcakes as cattle feed.

Neem or true neem—is a medium-sized tree fairly common throughout India except in the north and west. Its seed is the principal source of neem oil and neem cake. Two other species closely allied to neem are also common in the State. One of these is *Melia Azedarach* L., or *Hutchu Bevu*, a small tree, common throughout the plains. The other, *Melia composita* Willd., or *Hebbevu* is a lofty tree of *Ghat* forests. *Melia Azedarach* or the Persian Lilac is much cultivated around towns and villages of the plains. Though the seeds are rich in oil it is hardly of any significance commercially. The tree is pollarded so severely to furnish forage for sheep and goats that it presents a common, unsightly object. The seeds are often made into rosaries, hence its other name, the Bead tree.⁴ *Melia composita* Willd. (*Melia dubia* Hiern.) otherwise known as the Giant neem, is very little utilized, mainly due to its inaccessibility. The timber is soft and is locally used for building purposes and agricultural implements. Exploitation of the wood in the manufacture of matches and pencils appears to be worthwhile. The dried fruits are sometimes collected on account of their value in indigenous medicine.⁷

The true neem—*Bevu*—*Azadirachta indica* A. Juss, belongs to the family Meliaceæ. It is treated as a sacred tree by Hindus. It occurs wild in Burma and elsewhere and is largely cultivated and naturalised.³ Now the tree is found wild in dry forests of Deccan and is cultivated all over India. It is found to thrive on all kinds of soils but especially so on black cotton

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soils. The tree is eminently suited to purposes of afforestation in arid regions and is also a useful avenue tree.²

The neem is a large, glabrous, evergreen tree growing up to a height of 30-40'. Although described as an evergreen tree, in drier areas it often becomes deciduous. The tree has hard close-grained wood resembling mahogany. The leaves are imparipinnately compound with 7-9 pairs of leaflets. The leaflets are unequal at base, with serrate margins. The odd leaflet at the tip is often wanting. Flowers occur in axillary panicles, white in colour with a strong characteristic scent. Flowers are hermaphrodite, regular, pentamerous. Calyx is 5-lobed, corolla consists of 5 petals whitish much exceeding the calyx, and free. The staminal tube, slightly shorter than the petals, is 9-10-lobed at the apex. The anthers within the tube are opposite to and shorter than the lobes. Ovary is three-celled, with slender elongated styles. There are two ovules in each cell but only one develops. The fruit is a one-seeded drupe about the size of an olive and yellow in colour. Seeds are ellipsoid with thick fleshy, cotyledons, albumen 0. The radicle is superior. The flowers appear from March to May and fruits ripen during June to August.

As already mentioned, the tree is venerated by Hindus and is frequently planted along with *Ficus religiosa* or the "Sacred peepul". The presence of the tree around villages and on roadsides is considered beneficial. All parts of the tree contain a bitter principle and are used very much in indigenous medicine. From the bark there exudes a bright amber-coloured gum which is esteemed medicinally as a stimulant. The bark and leaves on account of the bitter principle contained therein, are sometimes used as a substitute for quinine. An infusion of the bark is considered to be a bitter tonic, astringent, and found useful in fever, thirst, nausea, vomiting and skin diseases. The leaves and flowers are supposed to possess antiseptic virtues and are widely used in case of infectious virus diseases. The dry flowers are considered as a good tonic and stomachic. The leaves are often steeped in hot water and used as a medicated bath. It is also used in external application for ulcers, skin diseases, as a poultice, ointment or linament. The dried leaves are often used as a preservative for books, documents and clothing. The powdered and dried leaf is also esteemed as an insecticide and is often mixed with grain and pulses stored in household receptacles. The smoke of the burning leaves is frequently employed

to get rid of noxious insects like mosquitoes from households. The twigs are largely used as tooth brushes, particularly in pyorrhœa. Root wounds yield a copious juice in spring, and this is used as a cooling drink, a stomachic and is sometimes made into toddy. The seeds are used as an insecticide and for washing hair, when it is supposed to be a very effective remedy for lice, dandruff, etc. The fruits are described as a purgative and emollient, useful in the treatment of intestinal worms, urinal diseases, piles, etc. The seed on expression yields an oil whose uses in medicine are highly spoken of. It is used in the treatment of leprosy, rheumatism, as a vermifuge for mange in dogs and in the healing of festering sores. The oil is also frequently used to kill borers attacking valuable trees. Other uses of oil are in dyeing, manufacturing of inferior washing soaps, medicated soaps and as an illuminant. The oilcake is a useful fertilizer. The wood is durable, hard, close-grained and weighs 50-52 lb. per cubic foot. The sapwood is grey and the heartwood red. The timber seasons well and is durable even in exposed situations and is much used for purposes of building, furniture and agricultural implements. It is suitable for carving but does not take polish well. Next to teak it is reputed to be a proof against the attack of white ants.⁸

The sap from the tree which is often made into toddy is sweet but has an unpleasant odour of neem. Its sugar content is 6.5 per cent. and other albumens and gums present is about 6.5 per cent. The gum which is used in medicine contains about 13-15 per cent. moisture, 3 per cent. ash, 12 per cent. galactans and 26 per cent. pentasans. The bark contains a bitter alkaloid, which on isolation occurs as long white needles. A bitter resin is also a constituent of the bark. The seeds contain a variable percentage of fixed oil reported as ranging from 31-45 per cent. The oil is bitter and can be extracted by heat or by pressure. It is deep yellow in colour and has a disagreeable acrid taste. It has a specific gravity of 0.9235 at 15.5° C. It can be solidified without loss of transparency. The oil contains fair amounts of free and volatile fatty acids. The oil has the following constants: $d/31^\circ$, 0.9129; $n_D/31^\circ$, 1.4658; Sap. val. 195.6; iod. val. 69.2; acid val. 11.2; the fatty acids are chiefly oleic about 53 per cent., stearic about 18 per cent. and palmitic about 14 per cent., together with small amounts of linoleic and arachidic acids. The "margosic" acid mentioned in early reports is a mixture of the usual fatty acids.

The glycerides of neem oil have been investigated and found to follow the usual rules of glyceride structure in seeds and fats. The bitter principle of neem oil have been obtained by extraction with alcohol yielding about 2 per cent. *Nimbidin*. This principal component is highly bitter and contains sulphur. On hydrolysis it gives nimbidinic acid, which is equally bitter and retains sulphur. Besides nimbidin, two bitter compounds free from sulphur have been obtained in very small quantities. Nimbidin and sodium nimbidinate are almost non-toxic. The oil-cake contains about 5.22 per cent. of N, 1.08 per cent. of P_2O_5 and 1.48 per cent. of K_2O .^{2,5}

Though neem is common in all parts of India, commercial exploitation of the produce is mainly confined to Uttar Pradesh and Mysore. Formerly a certain quantity of seed and oil used to find its way into Ceylon from Madras. According to a recent survey⁶ 500 tons of seed are said to be crushed in Uttar Pradesh producing 200 tons of oil. The oil is used in the manufacture of soap, in medicine, and as an illuminant. Mysore is said to crush 330 tons of seed and produce 100 tons of oil. A survey made by the Industries Department of the State in 1940¹ estimates the amount of seed crushed locally at 9,073 Rly. md. and oil produced at 2,722 Rly. md. (1 Railway maund = 82-2/7 lb.)

Accurate data as to the distribution and abundance of the trees, the amount of seed collected and crushed, quantity of oil produced, and the outturn of the cake are not available in Mysore. Current production of seed is estimated to be 8,500 Rly. md. Kolar is the most important district, particularly the taluks of Bagepalli, Srinivasapur and Goribidnur. Some quantity of seed is also collected in the districts of Mysore, Bangalore, Chikmagalur and Chitaldrug. The availability of the seed more or less coincides with the commencement of the pre-monsoon rains, and the break of the monsoon. This combined with the busy agricultural season leads to much delay and sad neglect in the collection and drying of fruits. It is reported that in some portion of the State although neem trees abound, the seed is not usually collected. The reason adduced being that the return is not commensurate with the pains taken for collection. The moist seeds deteriorate rapidly resulting in oil of poor quality and less of it. If held in bulk for any considerable period, the produce gets heated up and even charred. Seed is collected during April to June in the districts of Mysore, June to July in Bangalore and August to September in Kolar. Due

to poor keeping quality, seed is immediately brought to the village fairs and sold. Crushing is done soon after, mostly in village *ghanis* as small lots. June to September is the period of arrival on the market. Shimoga and Chitaldrug are two major assembling centres where annual sales of the seed are to the tune of 4,000 and 2,000 Rly. md. respectively. Goribidnur and Gundlupet are important places of minor assemblage. A very small quantity of well dried seed is retailed by local drug-gists for medicinal purposes.

Over 3,700 Rly. md. of oil and 4,700 Rly. md. of cake are estimated to be produced in Mysore. No seasonal trend is visible in the sale of oil. In season, collection, sale and crushing are undertaken rapidly due to the poor keeping quality of the seed. The oil is usually retailed and rarely appears on the market in bulk. Davanagere and Hindupur are important locally for the sale of oil. Together they market over 450 Rly. md. of oil. The cake is used locally as a manure chiefly for paddy. In its usefulness, the cake is intermediate between those of groundnut and castor.

Acknowledgements are due to the Departments of Forest, of Industries and Commerce, and of Marketing in Mysore for supply of much factual data.

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A NOTE ON PADDY CULTIVATION IN GOVERNMENT EXPERIMENTAL FARM, BABBUR, AND SURROUNDINGS

H. A. ABDUR RUBB*

THE water programme under Vanivilas Sagar is intermittent with 5 days 'on' and 8 days 'off'. This programme was originally meant to bring large areas under garden crops like cocoanut and plantain and semi-irrigated crops like sugarcane, cotton, tobacco, ragi and groundnut. During the recent years, on account of food shortage, a large area has come under paddy. Paddy cultivation in this area is largely confined to lowlying lands with heavy soils which have more water retentive capacity. Usually lands at higher reaches and also with light soils are avoided as the soils get very hard during the drought period of 8 days.

In the wet lands of Government Experimental Farm, Babbur, the soils are very poor and highly alkaline. They cannot retain water for more than 2-3 days. To grow paddy in such lands and take a good crop is extremely difficult.

The yield of paddy on the Farm over several years as reported in the annual reports of the Department will certainly bear out the unsuitability of easy paddy cultivation in the Vanivilas Sagar area. After the author was placed in charge of the Farm he tried certain judicious and careful methods to cultivate paddy on the existing soil of the Farm. The results obtained were really encouraging and it is the intention of this article to enunciate the methods adopted.

The success in growing paddy in lands with extremely poor soils and high alkalinity under intermittent irrigation lay in, (1) The raising of proper nursery, (2) Proper preparation of land, (3) Economic transplanting, (4) Proper bunding, (5) Cautious irrigation, and (6) Control of pests.

Nursery.—Nursery was divided into 1 *gunta* plots, each receiving 5 *seers* of selected seeds treated with Agrosan. The nursery was ploughed 5 times after which *honge* leaves were puddled into the soil and a cartload of compost was added.

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Sprouted seeds were spread over in the nursery bed and covered with sieved compost. Top dressing with ammonium sulphate at 4 lb. per *gunta* (1/40th acre) was given after a fortnight after the weeds were removed. The seedlings were about 6-7" in height and were fully developed in about 35 days and were ready for transplanting.

Preparatory Cultivation.—The lands were ploughed 8-9 times after which the cultivator was passed and lands were levelled. In case of lands which had paddy as previous crop, the bunds were trimmed and relaid. All holes and crevices in bunds were closed and the inside of the bunds was plastered with mud which on drying made the bunds hard and prevented water from escaping out of the plot. 2½ tons of green manure (*Honge* leaves) and 5 tons of compost and 1 cwt. of superphosphate, 1 cwt. of ammonium sulphate and 2 bags of groundnut oilcake per acre were applied, and the land was well puddled and ready for transplanting. It was found cheaper and more advantageous to grow green manure with a dose of superphosphate at 1 cwt. per acre than puddling the *honge* leaves just before transplanting as is done in this area.

Economic Transplanting.—2 seedlings were transplanted 5-6" apart. In lands where double the above dose of manure was given even single seedlings with 6-8" spacing established very well and gave upto 40 tillers in every clump. The seed rate at the above rate was only 6 seers per acre. Additional dose of ammonium sulphate at 1 cwt. per acre was applied 4 weeks after transplanting. In a small plot of ½ acre where double dosage of manure was applied, third dose of ammonium sulphate 2 weeks later was also given at 1 cwt. per acre. This gave an yield of 25 pallas per acre.

Proper Irrigation.—As the soil is red sandy loam, particular attention was paid to irrigation. The bunds as already stated were plastered with mud on the inside to close all crevices and holes and make the bund hard on drying to hold water fast. One experienced man was made responsible to irrigate every 5 acres. His duty was to allow water on the very first day in all the plots taking necessary precautions to avoid rushing of water. During the 5 days when water is available, his duty was to keep bunds intact and allow continuous flow. When water was stopped he had to raise the *madabai* (ಮಡಬಾಯಿ) to see that the water-level in the individual plot was raised. If an uniform

stand of 3" of water is stored in each plot, the chances of the moisture to continue during the entire week when water is completely stopped, are greater. It is found by experience that due to havoc of crabs in the nights, some of the plots do loose their water which goes to adjoining plots or into the drain. The timely repairs to the bunds and re-distribution of water where even level permits reduce the chances of the plots becoming dry.

When once the plants are established and put forth tillers and cover the field, the chances of drying of the plots are reduced. It is for this very reason that the ryots use as high a seed rate as 50 seers per acre and transplant the seedlings in bunches of 6-8 very close to each other. They do not therefore believe in the low seed rate.

Control of Pests.—Two dustings with Gammexane were given at interval of one month to reduce some of the minor pests like grasshoppers, beetles and caterpillars which damage the leaves. Light traps were arranged periodically to reduce the incidence of stem borer which is a common pest on paddy.

Conclusion.—In the above article one finds nothing new about paddy cultivation. This article is meant only for the paddy cultivators under Vanivilas Sagar area, who as many ryots in the other localities, sow nurseries with high seed rate of 1 palla of seed in 4-5 *guntas* of nursery to cover an area of 2-2½ acres. They transplant paddy in bunches of 6-8 seedlings 3" apart. Most of them are anxious to irrigate their paddy crops by flooding water and do not pay particular attention to the judicious irrigation which not only conserves the surface soil but also helps in the longer retention of the moisture. They do not use the fertilisers particularly phosphatic manures which are equally, if not more important than the nitrogenous manures. Due and timely attention is not paid for the control of pests and diseases. In spite of all the above defects some of the paddy-growers in this area grow as high as 20-25 pallas of paddy per acre because of their application of liberal quantities of farmyard manure, green manure and 2-4 bags of groundnut cake per acre. Their lands on account of repeatedly coming under paddy crop are more fertile and less alkaline. If they were to follow the methods adopted at this Farm during the past two years, they can considerably increase their yield and also save large quantities of seeds that are wasted now. Actually a 86 per cent. increase in the yield per acre over the previous

year's yield on an average has been obtained in the Farm during the first year and more than 160 per cent. during the second year. In addition, 30 seers of seed paddy per acre has been saved by judicious sowing at the nursery stage and also economic transplanting.

The Japanese method of paddy cultivation now being popularised, aims at the seed selection, seed treatment; and raised nursery beds to get strong seedlings. Growing of green manure with a dose of superphosphate and followed by liberal application of farmyard manure or compost and fertilisers, economic transplanting and proper and timely weeding and stirring the soil followed by another dose of fertilisers increases the yield of paddy considerably. This is not much different from what is followed at this Farm during the past two years, except for the raised bed nursery and transplanting in regular rows.

Selected Article

GRAFT MULBERRY

H. S. VENKATA RAO*

[Mulberry grafts give higher yields of nutritious leaves than bush mulberry cultivated in many parts of Mysore. The cocoons raised on the larger, thicker and more nutritious leaves of grafts are superior. The following interesting article by Sri. H. S. Venkata Rao, B.Sc., Director of Sericulture, on a "Plan for the Production of Graft Mulberry" in the *Industrial Magazine* (Vol. 1:3:7-12, December, 1953), gives details of cultivation and production of graft mulberry.—Ed.]

MORICULTURE, or the cultivation of mulberry, is an essential prerequisite for the success of sericulture, for domesticated silkworms thrive only on this essential food. The mulberry is grown as a bush or tree, mostly using local varieties.

The bush-type mulberry has been cultivated in most parts of India. Only one variety, the Mysore variety, known popularly as *Yennerangina Kaddi*, has been used in Mysore and Madras. On a small scale and in the farms maintained by the governments of the sericultural states, grafts have been raised. In some States, sericulturists have planted grafts in some plots. Grafts give 30 per cent. higher yield of more nutritious, larger and thicker leaves than bush. The cocoons raised are superior. Storage of leaves for 3-4 days is made possible.

It is needless to stress the importance of graft cultivation, as all progressive countries in the world raise graft gardens only because they are better and more economical.

Under temperate and subtropical conditions mulberry is grown in localities with an average rainfall between 60" and 100" per annum, spread uniformly throughout the year. Under Mysore conditions rainfall is only about 25-30" per year and occurs for only 5 or 6 months in the year. It is, therefore, difficult to raise grafts in rain-fed areas of South India, as plants are likely to die in large numbers if the rainfall is sparse during the planting season. An initial failure will discourage mulberry growers. Hence it is necessary to popularise grafts in areas where irrigation facilities exist.

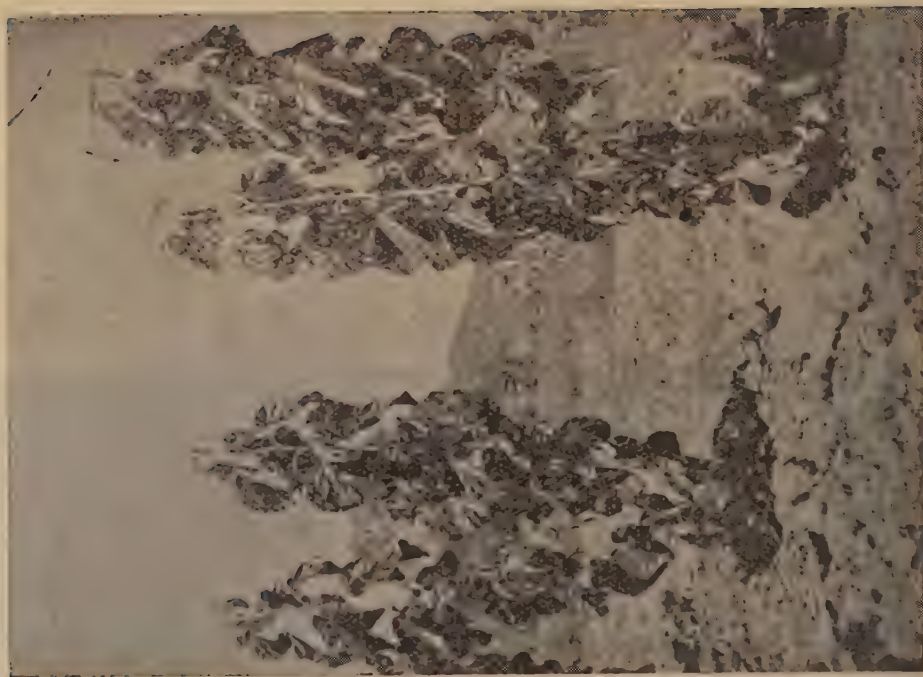
* Director of Sericulture.



Graft Mulberry Plantation at Channapatna



Mulberry—Local and Graft



Graft Mulberry—Mysore Stock—Japanese Scion

Sericulturists who have cultivated or seen mulberry grafts have been impressed by the succulent large leaves, the ease of harvesting, and the good development of worms fed on graft leaves. Popularisation of grafts will, therefore, not be a serious problem. The problem will, however, be the supply to meet the demand at a cost within the reach of the mulberry grower.

The preparation of grafts involves cultivation of the two varieties of mulberry required for the stock and the scion. The variety used for stock is a local variety, hardy, acclimatised and easily cultivated. The scion is usually a foreign variety, a diploid or a polyploid which cannot be propagated by vegetative methods such as cuttage. Varieties which can be propagated by cuttings are not selected for scions. If such varieties are used, the gain in quality or quantity is not great. When a graft is planted, and displacement or break of the union occurs, the scion or stock variety, or both, may root and become plants. This will result in a garden of mixed varieties. Harvesting then becomes difficult, and an adjustment of leaf quality to state of rearing becomes difficult.

In Mysore and Madras States the variety used for stock is the Mysore variety which is native to Mysore. The variety is propagated by cuttings or seeds. The former is the popular method for planting bush gardens, and the latter is becoming popular as the gardens raised by planting seedlings give higher yields and more nutritious leaves. The seedling method should be preferred to the cutting method for raising stocks for grafting.

In cuttings, many roots (fibrous roots) start growing. The thickness of roots will diminish with the number of primaries. Hence many cuttings will not produce roots of sufficient thickness. This results in large rejections after growing them for over 4 months. The roots have a brittle bark which tends to split during insertion of the scion. If the injury thus caused is large, there are few chances of survival of the graft. Seedlings, however, are free from these defects. They develop quickly a thick tap root covered by a pliant and latex-filled bark. Injuries heal quickly. The seedlings are ready for grafting in 3-4 months. It should therefore, be clear that seedlings should be used for grafting. This is the first big task in the formation of a nursery.

Collection of fruits from tree or bush, preferably the former, is a difficult task in Mysore because sericulturists prune

gardens annually. Fruits are borne on the previous year's stem. Hence bush plantations or trees should be specially raised for preparation of seeds. Ordinarily about 300-400 lb. of fruit can be picked from an acre of mulberry tree or bush. About 40 lb. of fruit are required to press out 1 lb. of seeds. The viability of seeds decreases with age. Fresh seeds and seeds not more than 1 month after picking will give about 80-90 per cent. germination. 2.5 lakhs of seed weigh 1 lb.; 600 seeds weigh 1 g. approximately 3-4 months after sowing, 60 per cent. of the seedlings will attain the optimum size for grafting. Hence 1,35,000 seedlings fit for grafting can be raised from 1 lb. of seeds.

The raising of seedlings involves two operations, viz., (i) sowing mulberry seeds in beds, and (ii) transplanting 6-weeks seedlings to graft nurseries. These two operations can be carried out on the same land. About 90,000 seedlings can be planted in an acre, allowing 6" between two successive plants in a row and 9" between adjacent rows. Hence about 2.5 acres of land will be required for raising seedlings from 1 lb. seed.

A popular and tried variety used for scions in Japan is "Kaeryo Nezumi Gaeshi". This variety was imported in 1950 and is under cultivation in many parts of the State. A plot of 10 *guntas* in the Government Mulberry Gardens at Mysore produced sufficient scions for preparing 50,000 grafts at the end of about 18 months after import. This variety cannot be ordinarily propagated by cutting but only by layering. About 30 *guntas* or $\frac{3}{4}$ acre land will become necessary for raising scions for seedlings from 1 lb. of Mysore seed. It is quicker and easier to import saplings from Japan than to raise layers. Layerage takes nearly twice the time.

Having raised seedlings of the Mysore variety and Japanese scions, the next process is grafting. Several methods were tried, such as budding, wedge, cleft and root grafting. The last-named is the simplest, quickest and most successful method. In root grafting the seedlings raised in the nursery are cut at the root and stem union or a little below. The scion is then shaped and pushed between the bark and heartwood of the scion. The new-made graft is then covered over with earth. A skilled worker can do about 100-150 grafts per day. It needs no more attention than the ordinary cultural operations. In Mysore conditions the graft was ready for distribution within 6 months.

These grafts should be planted 5' between rows and 5' plant to plant for raising a graft garden. About 1,600 grafts will suffice for planting an acre.

If grafts should replace bush in irrigated gardens in Mysore in the first instance, about 32 million grafts should be made available at 1,600 grafts per acre. About 200 acres of land will be required to raise this large number in case a 3-year programme of distribution is adopted. The expenditure on the land will amount to Rs. 2 lakhs, and that on maintenance about Rs. 6 lakhs per annum or about Rs. 18 lakhs for 3 years; of this about Rs. 18 lakhs can be realised by selling the grafts at cost.

In Japan, the seeds for raising the stocks and scions are distributed free to nurserymen by the National Experimental Station and the Prefectural Stations. There are about 15,000 nurserymen. A nurseryman raises the stock, grafts during the season, maintains the saplings for 1 or 2 years, and after inspection of the saplings by Government Inspectors, sells the grafts to mulberry cultivators. The nurserymen are given a short training in grafting in the Prefectural Stations. Besides, seeds for raising stock and scions are supplied by the Government agency. Each nurseryman can raise and maintain from 25,000-1,00,000 grafts. This system has worked successfully in Japan, and given the same assistance and an encouragement bonus in the first three years, the same system ought to work successfully in this country.

Extracts and Selections

PLANTATION HYGIENE AND RHINOCEROS BEETLE (*ORYCTES RHINOCEROS*)

[The following are extracts from some notes by the Government Entomologist, Papua and New Guinea—Mr. G. S. Dun, and have been reproduced here to bring home to our coconut garden owners the importance of Plantation Hygiene in the control of pests and diseases.—*Ed.*]

VARIOUS procedures can be adopted which, if carried out thoroughly and continuously, will tend to reduce the incidence of beetle attack, particularly in the case of heavy and localised outbreaks.

Damage to palms is caused solely by adult beetles. Generally speaking, eggs will be deposited and larvæ develop in any medium which contains a reasonable amount of rotting vegetable material. This covers such a wide range of materials that it would be an evident impossibility to check the beetle by eliminating all the available breeding grounds. There are, however, a number of obvious sites which should be removed, destroyed or avoided as a matter of standard plantation practice, since they provide foci from which concentrated attacks on nearby palms will develop.

It is possible to list a number of media which are extensively used by beetles for egg-laying. These include :

- (1) Dying and dead coconut and other palms whether left standing in the plantation or used for building purposes.
- (2) Town or village refuse heaps.
- (3) Vegetable rubbish—rotting fruit.
- (4) Waste material from saw mills.
- (5) Rice husk.
- (6) Banana Stools
- (7) Decaying logs.

Coconut husks do not appear to harbour the beetle larvæ but it is better to spread them in an even layer instead of in heaps.

Any vegetable matter that is allowed to accumulate is not immediately suitable for the beetle to breed in. The optimum

stage of attractiveness is reacted some 3 months after it has been put down and the attractiveness remains only for 9 months to 1 year by which time full decomposition has normally been completed. This time factor then will allow vegetable accumulations to be disposed of over a considerable period thus avoiding any marked disruption of normal plantation routine.

Cattle sheds, night paddocks, manure pits, etc., will always develop a heavy infestation of rhinoceros beetles in their immediate vicinity unless the dung is regularly turned and grubs destroyed or is treated with some soil insecticide like chlordane.

(a) The dead or dying palms appear to be the most favoured breeding site, each one being capable of supporting as many as 100 or more full grown larvæ. It is preferable to cut the palm out slightly below ground level. Trunks can be effectively burnt if care is given to stacking. The trunks should be cut into 3-4 lengths and then split into four. If these sections are stacked so that only two lengths are in contact with the ground and the remainder criss-crossed above them, they will dry out too rapidly for them to become suitable breeding grounds.

As a general practice, the use of sound coconut trunks for constructional work is not to be recommended. If there is no alternative, the cortex should be removed and the trunk and both ends should be treated with creosote. Even then the posts should not remain in use for a period longer than 9 months.

(b) Refuse heaps should be completely burnt or the unburnt residue will only form a further breeding centre.

(c) Banana constitutes a two-fold attraction to the rhinoceros beetle. The adults feed rather readily in the growing plant while the rapid breakdown of the plant after fruiting renders the ground in the immediate vicinity of the rooting stump a suitable site for egg-laying.

—Condensed from *The Papua and New Guinea Agricultural Gazette*, 8 : 1 : 1948-51, July 1953,

CAULIFLOWER GROWING

[The following extracts from P. S. Fajardo's article on "Cauliflower Growing in Los Banos" in the *Philippine Agriculturist*, 36:2:90-95 (July 1952), sum up the results of two-year planting.]

CAULIFLOWER, *Brassica oleracea* Linn. var. *botrytis* Linn., is an annual plant grown for its tender, succulent, thickened, profuse, undeveloped flowers and flower stalks instead of its leaves, although the young and tender leaves are as palatable as mustard. This excellent vegetable has been known for more than 2,000 years in Europe and perhaps 200 years in America (It is a native of Europe and West Asia and was mentioned as early as 540 B.C.—*Ed.*). The sensitivity, difficulty of culture and relatively high price of the cauliflower have made it the aristocrat of the cabbage family.¹

It contains fair amounts of vitamins A and C and is a good source of vitamin B. It is an important source of various minerals needed by the body. It contains nearly ten times as much calcium as meat, fourteen times as much as rice and twice as much as eggs. (According to Nissley² it contains 91.7 per cent. of water, 2.4 per cent. of protein, 0.2 per cent. of fat, 0.85 per cent. of ash, .025 per cent. calcium, 4.9 per cent. total carbohydrates, 0.9 per cent. fibre, 2.6 per cent. sugar and .0009 per cent. iron. It is an excellent source of vitamin C and a good source of vitamins B₁ and B₂. It has a calorific value of 140 calories per pound.—*Ed.*)

Soil and Climatic Requirements.—Cauliflower can be grown successfully on heavy to light soils of good fertility, rich in organic matter and high in nitrogen content. For production of high quality curds, however, fairly heavy soil of high water-holding capacity is the best. Good drainage is essential. Good crops are also produced from lighter soils if fertile and well supplied with moisture. Unsatisfactory soil conditions may upset the development of the plant and cause premature formation of small heads or "buttons".

Cauliflower must be grown in places where low temperature and a relatively high atmospheric humidity prevail during the growing season.

¹ Some wag has defined cauliflower as "Cabbage with College Education"!—*Ed.*

² *Vegetable Gardening*. C. H. Nissley (New York, 1942),

Preparing Seed-Bed.—It measured 1 metre by 10 metres and required 5 such seed-beds to a hectare (roughly 5 seed-beds each measuring 1 yard by 5 yards for 1 acre). The seed-bed was deeply dug, pulverised, levelled and smoothed. It was sterilised to prevent damping off disease of seedlings) by “firing” (spreading rice, straw, etc., over the beds and burning) three times—each time the soil was turned to heat the under-surface.

Sowing.—250-350 g. of seeds per hectare (or 100-121 g. per acre or 3·5-4·36 oz. per acre) were sown thinly by broadcast; covered just enough with broadcast soil and watered. To hasten germination the bed was covered with clean gunny. The seeds germinated within 3 days.

Ants which steal the seeds or bite them were prevented by scattering “rice-short” baits in large quantities. Watering was done twice daily and the seedlings were protected against strong sunshine by portable sheds (*thatties*). To quicken growth they were watered once a week with a solution of 50 g. ammonium sulphate to every 5 gallons of water ($1\frac{3}{4}$ oz. in 5 gallons or about $1\frac{1}{2}$ oz. for every kerosene tinful of water). The seedlings were watered again with plain water to prevent scorching.

Pricking.—The seedlings were pricked when they had 1 or 2 pairs of true leaves (2 to 3 weeks old or about an inch or two high) 2" each way, partially shaded and fertilised. They were made more hardy by gradually exposing them to higher temperatures and by withholding the fertiliser solution for a week before transplanting.

Preparation of the Field.—The field was prepared as soon as the seeds had been sown in the seed-bed. The field was ploughed two or three times and harrowed as many times. The next step was “bedding” or ridging the land. The beds were spaced 30 cm. (12") and the width of each bed was 40 cm. (16").

Transplanting.—Should be done on a cloudy day when possible. The seedlings were transplanted 4-5 weeks after sowing or when they were approximately 7-10 cm. (3-4") in height. The seed-beds were watered to loosen the soil to minimise the destruction of roots. With the help of a hand trowel the seedlings were lifted and placed in a shallow basket for transporting to the field. A hole was dug in the centre of the bed and the seedling with a ball of soil was set in slightly deeper than

the original level of the plant in the seed-bed. Then the soil was returned into the hole and the soil around the plant was slightly firmed. The plants were watered after transplanting and weeding was done as frequently as the weeds appeared. Deep cultivation was avoided, especially during the later stages of growth as the roots would be injured. Partially decomposed horse manure was applied at the rate of 300 g. ($10\frac{1}{2}$ oz.) to a plant or 10 tons to the hectare (4 tons per acre). Ammonium sulphate was also applied at the rate of 10 g. ($\frac{1}{3}$ oz.) to a plant or 250 kg. a hectare (224 lb. per acre) by "ringing" the soil around the base of each plant and covering the fertiliser lightly. The first application was made a week after transplanting; the second, 2 weeks after the first application.

Harvesting.—Cauliflower heads or curds must be cotton white when properly grown. The curds that are of prime condition for harvesting must be fully developed, compact, clear white and free from any discolouration or "riciness". When exposed too much to sunlight, the heads do not only become unattractive but also acquire an undesirable flavour. It is essential, therefore, that they be protected from strong sunlight to obtain the quality demanded. This was done by gathering the longest leaves together over each head and tying them with a strip of banana leaf-sheath. This practice is known as *blanching*. Blanching was employed when the buttons or small heads were as big as 50 centavo pieces.

The cauliflower heads do not all develop heads at the same time. It is necessary to go over the entire field and blanch those that are ready. Blanching, however, can be dispensed with if the buttons are protected by the small incurved leaves surrounding the head or by the leaves that are long and upright.

The curds must be harvested promptly. Over-developed curds become "ricy" and "feathery". In this condition, they are unsavoury and have little or no market value. The size or the heavy weight of the heads is not a proper criterion for harvesting. In fact, it is better to harvest the heads a little early than late. The average diameter of curds ready for harvest is about 10-12 cm. (4"). Cauliflower matures within 3-4 months after sowing. The heads were cut leaving one or more whorls of leaves intact for protection of curds.

CAULIFLOWER AND BORON DEFICIENCY

After 5 years' observation and experience, E. J. Waring, Agronomist, New South Wales Department of Agriculture, considers that the incidence of a number of cauliflower diseases is largely dependent on soil fertility, soil texture and drainage. In an interesting article in the *Agricultural Gazette of New South Wales* (64: 9: 466-70, Sept. 1953), he states that 'hollow stem', 'cat's claws' or 'stem crack' of older plants and 'curd browning', 'knobby curd' and 'curd split' of mature plants are considered to be manifestations of boron deficiency. "Some soils either in the virgin state or after intensive cultivation may show an actual deficiency of boron and respond to borax dressing. Such dressings are also appropriate where heavy liming has been carried out with subsequent evidence of boron deficiency. Dressings of 8-10 lb. of borax per acre are recommended and the benefit of such an application appears to persist for at least two seasons. Discretion should be exercised as relatively low rates of application (about 40-100 lb./acre) may cause toxicity symptoms especially in susceptible crops such as beans."

LITCHI, LYCHEE (*LITCHI CHINENSIS* SYN. *NEPHELIUM LITCHI*)

[Litchi is an evergreen subtropical fruit tree, native of South China and grown commonly in Northern India. It grows to a height of about 20-23' and has a handsome round crown of glossy green foliage. The fruits which are borne in clusters resemble the strawberry, green yellow to deep rose in colour when ripe. Although it grows luxuriantly and gives heavy crops of fruits in the hills and plains of South India—upto an elevation of 3,500' it is little known to the people of the south. It is best suited to a moist subtropical climate found in many parts of Mysore. The following extracts from an article in the *American Fruit Grower* by Eldon S. Banta makes interesting reading.—Ed.]

"FLORIDA has a new and exciting industry just beginning its development, the growing of the ancient oriental Lychee. The tree is long-lived. The two oldest trees still growing in Hinghwa in Fukein Province of China are said to be 1,200 years old. The largest reaches up to a height of 75' and measures 5'-10½" in diameter.

In Florida it seems to thrive throughout the citrus belt. Land is cleared and worked in the same way as in the preparation for planting citrus trees. Trees are set at any time of the year. Planting distance is 40' on the square with a tree set in

the centre between each row. This requires about 50 trees per tree.

Lychee trees require about the same fertiliser treatments as do citrus. The trees are fertilised 3-4 times a year at about the time they make a flush in growth. Very young trees receive only a very small handful of fertiliser (a mixture of 4-7-5 or 4-8-8). A large tree will receive 1 b. of fertiliser for each foot of spread of branches at each application.... No pruning or thinning is required. Propagation is by "gootee" or air-layering.... It takes between 3 and 4 months from the time layering begins until a new tree is ready for planting.... Bulk of the layering is done in summer.

In Florida the Lychee blooms in the latter part of February and harvest is between June 20th and July 10th. Once ripe the Lychee tree will remain on the tree for about 2 weeks. Under refrigerators the fruit will keep its rich red colour for about 3 weeks. The use of Plio film to hold the fruit has added 2-3 weeks more to the marketing season.

The mature fruit is of a bright strawberry colour and measures about $1\frac{1}{4}$ " in diameter. The outer layer (peri-carp) is tough, sometimes brittle and not edible. This is easily broken and just inside lies the firm white juicy pulp. The pulp is very sweet slightly subacid and possesses a flavour that some have likened to a Bigarreau cherry or to a Muscat grape.

A four-year-old tree may produce 2 or 3 lb. of fruit and will increase its yield each year until it may yield over 400 lb. in later years.... With 50 trees per acre and a yield of 300 lb. per tree a 12-15-year-old orchard will yield 15,000 lb. per acre.

The Lychee* is one of the world's finest fruits and almost universally liked.... The fruit makes delicious, frozen, canned, preserved, spiced, dried and fermented products.... The fresh fruit will always remain a delicacy.

* Litchi layerings may be available at Kallar and Birluar Fruit Research Station of the Madras Department of Agriculture or at Lalabagh, Bangalore.—Ed.

Research Notes and News

Vaccination against Ranikhet Disease in Poultry

EXPERIMENTS conducted in Madhya Pradesh during the last 5 years show that—

(1) The minimum effective age for vaccinating chickens successfully against the Ranikhet disease is 9 days.

(2) Vaccination after 24 hours of natural or artificial infection is effective in preventing birds from developing the disease.

(3) Wholesale inoculation of fowls inclusive of those in the incubative stage is the only means to cut short the course of field outbreaks of the disease.

(4) Chickens can be successfully immunised simultaneously against both fowl pox and Ranikhet by carrying out scarification with a composite emulsion of Pox and Ranikhet vaccines.

(5) It is not safe to inoculate day-old chicks from unprotected hens. Day-old chicks hatched out from eggs of birds protected against Ranikhet possess a considerable degree of inherited immunity while those from uninoculated hens are fully susceptible.

(6) The same needle can be utilised for carrying out inoculation of both diseased and healthy birds without any change or sterilisation since the vaccine pushed in at inoculation counteracts the relatively small virus conveyed and confers immediate protection by interference.

(7) In order to control an outbreak of Ranikhet disease and reduce losses in the affected flock to a minimum it is essential to carry out wholesale inoculation as early as possible at the first appearance of trouble. Inoculation done even as late as 72 hours following infection will have some use in saving about 25 per cent. of the fowls in the incubative stage of the disease which would otherwise succumb.

—Condensed from I. B. Mirza's note in the *Indian Veterinary Journal*, XXX : 3 : 242-43 (Nov. 1953).

Fowl Typhoid

FOWL TYPHOID is one of the oldest diseases of poultry and was first seen in Britain in 1890. The causative organism belongs to the same group of bacteria (*salmonella*) which causes the dreaded B.W.D. (Bacterial White Diarrhoea) or pullorum in many parts of the world. In recent years fowl typhoid is on the increase and the United Kingdom Ministry of Agriculture have conducted an enquiry into the incidence of this disease and work on a more effective vaccine is in progress.

The disease can be introduced by food material, dried eggs, etc. One serious fact to contend with is that birds which have recovered from the disease continue to be carriers and are therefore a menace.

Unlike other *salmonellæ*, this disease occurs mainly in mature or nearly mature birds and mortality can be exceptionally severe. The outstanding symptoms are listlessness, profuse green diarrhoea and anaemia. Death usually occurs in 48 hours after appearance of symptoms.

India was happily free from this disease till recently and the first outbreak of salmonellosis was recorded only in 1949.

Dr. S. B. V. Rao (who served in the Mysore Department of Agriculture as Special Poultry Officer and who is now working in the Poultry Research Section of the Indian Veterinary Research Institute, Izatnagar) and his co-workers Narayanan, Ramnani and Das have described in the *Indian Journal of Veterinary Science and Animal Husbandry* (XXII, 3, 199-208 and 217-223, September 1952), the "occurrence of an explosive outbreak of fowl typhoid which took a heavy toll of the breeding stock on a large poultry farm in India in 1949" and how the outbreak was controlled and the disease eradicated by blood testing of the stock. They also report the development of an improved antigen for *Salmonella pullorum/gallinarum* with a high antigenic specificity for use in the rapid whole blood agglutination plate test. The antigen proved superior to two earlier ones by detecting carrier birds of low titres ranging from 1-16 to 1-60. The antigen preserves its qualities up to 145 days under 60° F. refrigeration.—*Ed.*

Tobacco Research in India

[ALTHOUGH tobacco is a non-indigenous crop introduced by the Portuguese in the early part of 17th century, India is now one of the principal tobacco producers next in rank only to U.S.A. and China. In the export trade of the country it occupies the eighth place and contributes to the national exchequer by way of excise and taxes nearly Rs. 35 crores. With a view to improve and extend tobacco cultivation and step up production of quality leaf, the Indian Central Tobacco Committee was set up in 1945. Under its auspices several main and sub-stations for research on different types of tobacco—cigarette, bidi, cigar and chewing, have been started.

The principal results obtained at these stations are summarised here for the benefit of busy readers. Those who want detailed information may consult the *Eighth Annual Report of the I.C.T.C.* (1952-53) a copy of which is available at the Central Library, Department of Agriculture, Seshadri Road, Bangalore. —Ed.]

(1) The best temperature for germination of seeds of flue cured tobacco was found to be 70-74° F.

(2) 80 lb. of nitrogen (as ammonium sulphate) with 3.3 lb. of seeds per acre of nursery appears to be a good combination.

(3) For Guntur conditions plantings in October gave higher yields than those in November. There was a gradual decline in yield as the transplanting was delayed.

For *bidi* tobacco in the Nipani area highest percentage of bright grades were obtained in plantings of the second half of August and first week of September.

(4) At Nipani (*bidi* tobacco area) topping at inflorescence stage gave significantly higher yields but there was a reduction of brighter grades.

(5) Green manuring with maize appears to be a promising method of soil adjustment to improve leaf quality.

(6) The best percentage of bright grades of leaves (cigarette tobacco) were obtained from about the 11th node. Leaves between positions 12-20 are the best developed leaves with high moisture, high starch and high sugars in cured leaf and low nitrogen.

(7) The variety Chatham (cigarette) tobacco did well in Gujarat and Mysore and in certain areas of Northern Circars. Three years' study indicate that Chatham is superior leaf by leaf to Harrison Special in both yield and quality. It has better aroma and responds well to topping.

(8) Perenox or Blitox checked the incidence of "damping off" (in the nursery) better than the other fungicides.

(9) For *bidi* tobacco nursery, castor cake was better than farmyard manure. Of the two seed rates $4\frac{1}{4}$ and $8\frac{1}{2}$ lb. per acre there was no significant difference except that under higher seed rate the seedlings did not get stocky.

(10) Experiments at the Bidi Tobacco Research Station have shown that 160 lb. of nitrogen as oilcake, a spacing of $3' \times 3'$ and topping at 11 leaves per plant would be the optimum combination. Although the Gujarat farmers' method of applying 5 tons of farmyard manure, 40 lb. of nitrogen as oilcake, $2\frac{1}{2}' \times 2\frac{1}{2}'$ spacing and topping at 14-15 leaves gave 3.6 per cent. increase in yield over the former method, the leaves were however better, had higher nicotine content and fetched an extra profit of Rs. 253 per acre when compared with the Gujarat farmers' method.

(11) Increase in the level of nitrogen generally increased the nicotine content of *bidi* tobacco leaf, whatever the source of nitrogen, *viz.*, farmyard manure, groundnut cake and stem dust.

(12) In the case of chewing tobacco, the farmer's method is to manure with 30 cartloads of farmyard manure, plant $30'' \times 20''$ spacing (10,500 plants per acre) and top plants maintaining 10 leaves. The results obtained at the Cigar and Cheroot Tobacco Research Station at Vendasandur indicate that 20 cartloads of farmyard manure, *plus* 100 lb. of N per acre, $30'' \times 24''$ spacing (8,700 plants per acre) and 10 leaves per plant are the optimum treatments.

First Woman Scientist

THE first woman scientist at Rothamsted or any other agricultural institution in Great Britain (1906) Dr. Winifred Breckley, Agricultural Botanist, Rothamsted Experimental Station, died at Harpenden on October 27, 1953. In 1906, after her education at Swanley Horticultural College and University College, London, she joined Rothamsted. She started investigations on water culture of plants and narrowly missed discovery of the essential role of trace elements. She initiated ecological studies of the complex floras of farmed land. She was the author of a number of books: *Inorganic Plant Poisons and Stimulants* (1914); *The Manuring of Grassland for Hay* (1924); *The Weeds of Farm Land* (1920); etc.

(From *Nature*, 172 : 4386, November 1953.)

Union Activities

SECRETARY'S SECTION

Address presented to Dr. Leslie C. Coleman, M.A., Ph.D.,
Director of Agriculture in Mysore, and the President, The
Mysore Agricultural and Experimental Union, by the Members
of the Mysore Agricultural and Experimental Union, on 3rd
July 1925.

Dear Sir,

ON behalf of the agriculturists of Mysore, we beg you to accept this inadequate expression of our regard for you and our grateful appreciation of your valuable services to our country. You came to us seventeen years ago when agricultural work was just being organized in the State, and you brought with you a brilliant intellect, undaunted courage and a radiant hope, which is the strong man's gift from God.

For seventeen years you have given us unstintedly of your best—the treasures of a rich and original mind, an energy which knew no fatigue, and sympathy which recognized no bound or barrier. Whether fighting the *Koleroga* in the dripping areca gardens in the Malnad, or investigating agricultural problems under the burning skies of the maidan, whether conversing with the *raiylats* in their fields or urging the need for funds and equipment in the high places of the State, you have always been the guardian of the interests of the agriculturists and their honoured friend.

From modest beginnings, the Agricultural Department grew under your hands, branch by branch and section by section, under able workers fired with your own zeal till it became the pride of our State and the admiration of the rest of India. You might justly claim—what one less modest claimed of the French State—"the Agricultural Department, I am the Agricultural Department"; for you built it up and breathed into it your own spirit of service. The wealth you have won for the people of Mysore and the losses you have saved to them, though great, may yet be estimated; but the change of outlook you wrought and the inspiration of your high example defy valuation.

Of a man's work with men, it has been justly said that the greatest and most enduring portion is in the heart and the head; on this view, we may confidently say that your work has been well and nobly done and that the foundations of the agricultural edifice have been truly and justly laid. The secret of your power with us is your sympathy and that great gift born of sympathy and imagination—the power to put yourself in another's place and realize his point of view. We have known you in our villages trudging cheerfully across sodden fields in pouring rain; you have accepted of our humble hospitality and entered unreservedly into our lives and interests. Is it any wonder that we have learnt to look on you as one of ourselves?

We, of the Mysore Agricultural and Experimental Union, have a manifold claim on you. Agriculturists ourselves, we also represent the general body of cultivators and focus their feelings towards you. Ours, besides, is the proud privilege of being your personal friends and comrades. Under your leadership we have pioneered agricultural development by testing and demonstrating improved methods and serving as interpreters of the laboratory to the field; and it was our earnest hope that in this great work we would have the benefit of your vast experience and wise direction for many more years to come. But circumstances seem to have compelled you to leave us though, we hope, only for a temporary period.

Expressions of sorrow avail nothing and would only sadden our hearts and weaken us when we should be strong. We understand that you go for reasons of health and that it is quite necessary that you should go. We shall only say this—that if the affectionate regard of a whole people had the potency to heal, or their earnest wish the power to prevent your departure, you should never leave us and you should always be healthy and strong.

It is now our duty, with all the strength of our hearts, to wish you and Mrs. Coleman and your little daughter a prosperous voyage, a glad home-coming and every happiness that blesses life. And we wish, both for the sake of the agriculture of our country and for the regard we bear you, that you will soon come back to us restored in health and strength.

**Address presented to Dr. Leslie C. Coleman, M.A., Ph.D., C.I.E.,
on His Visit to Mysore State, by the Members of the Mysore
Agricultural and Experimental Union, on 9th January 1954.**

Dear Sir,

BE it our privilege to feel it extremely happy in having you amidst us to-day. We are erring on the side of inadequacy of expression when we tell you that the name of one, about whom the band of workers he trained and gathered around him, felt that he always gave unstintingly of his best, and about whom it could be chronicled that he was looked on as a personal friend by cultivators throughout the State and that his name will long be remembered in many a humble rural home, has always had a charm for us.

The fight against the *Koleroga* of Areca, the attack against the grasshopper of jola, providing an improved plough for the Mysore farmer, the breeding of ragi, sugarcane and other crops to increase the yield from our fields—are a few of the items that remind those interested in the agriculture of Mysore, of your great efforts, comprising a wide range of activities in founding and developing the Department of Agriculture in Mysore. Your opportunities have naturally and in truth, covered the subject from A to Z, and we like to think of this aspect of things especially at a time when it is being recognised more than ever, that the problems of the farmers must be handled as a whole in an integrated manner.

One who turns to the pages of the *Mysore Agricultural Journal* cannot miss your old refreshing article 'After Twenty Years' about your native country, Canada. And it has greatly interested us all that even after retiring from here you have continued to work in the institutions of your country. It has been a lesson to all who are being drawn to the cult of the head, heart, health and hands, and a guide to those who would believe that 'Work is Worship'. And more than that, Sir, it assures us that when we are listening to you we are listening to a voice of experience.

Your spontaneous and generous interest in this part of our country has already taken you through several of its districts in your present itinerary; and we are sure we will have the benefit of your review of the state of agriculture here.

Twenty years of history stands between the time when the Mysore Agricultural and Experimental Union had last had the advantage of your personal advice, and now. During this interval the Union has had its ups and downs, though in the sum-total, we believe we are able to report some progress. Our membership is averaging about 3,000, with nearly 300 Life-Members; and the District and Taluk Committees are in the working. Field Days are being held in the villages and Student Farmers' Clubs are being sponsored. We are at the beginning of further planned work, when in view of the liaison afforded between the laboratory and the field, we are requesting Government for enhanced help and grants. Your advice at this juncture, Sir, will, we estimate, be of great inspiration to us.

You remember, Sir, you had expressed in a Message of yours to us, 'if you at all remember me, please think of me as a sort of *Sanyasi* of Science, who however retains all his human frailties'; and if that frailty of the loving heart be any of the stuff that has enabled you to give us this pleasant opportunity of meeting you, pray, permit us to be partners in that heritage.

**Address presented to Dr. Leslie C. Coleman, M.A., Ph.D., C.I.E.,
Director of Agriculture (Retired), Mysore, by the Members of
the Shimoga District Agricultural and Experimental Union,
on 11th December 1953.**

Respected Sir,

WE, the Members of the Shimoga District Agricultural and Experimental Union, warmly welcome you today after arrival to our model State.

Your magnificent and memorable services to the State in general and to this District in particular are still remembered and cherished. During this period, you laid the foundation of an efficient system of productive and remunerative agriculture in all its aspects, and it is no exaggeration if we say that in the difficult times of food shortage that occurred during recent war period and its further intensity thereafter, if our State found better than any other State similarly situated, it was mostly due to the desirable fact of our Agriculture being on the lines envisaged and chalked out by you.

During your tenure of office you were responsible for starting several productive schemes, experiments, research, and a

modern sugar industry, use of Bordeaux mixture against *Koleroga* in Areca, systematic soil survey, improved strains of Sugarcane and Paddy, Agricultural Education, Agricultural Land Colonisation and various other Departmental activities, were some among the outstanding achievements in the State. Realising that some sort of liaison is essential between the agriculturist on one hand and Department of Agriculture and scientific advancement on the other, you introduced the idea of Agricultural and Experimental Unions. This organisation has been and is still growing steadily day by day. We have now in this District over 2,000 primary members, 400 Active members and 67 Life-members. There are Taluk branches functioning all over the District. The members of this Experimental Union are proud to state that the agriculturists of this District provide the State with an annual supply of over 6 lakhs pallas of paddy out of their surplus production to meet the food deficit of the other parts of the State.

Areca, the most important commercial crop of this District, derived great benefit from the intensive steps taken to protect the crop against the ravages of *Koleroga* which annually used to destroy a good portion of the crop. With the phenomenal increase in the money value of this crop during the war years, the direct benefit to the agriculturists of this District, it is needless to state, were indeed great. Among the other benefits resulting to this District from your fore-sighted agricultural policy may be cited the development of Anjanapur, Lakkavalli, Tunga and Bhadra Projects, judicious use of chemical manures, mechanised farming, and better farming methods, have all improved the standard and increased agricultural production in the State. In this connection we wish to state that proposal to start a sugar factory in Shimoga Taluk is under the active consideration of Government. It would be a great advantage, if we could have the benefit of your valuable opinion and suggestions for the starting of this Project on sound lines. Your visit to this District, at this juncture, we consider it to be most fortunate, because it gives us an opportunity to get the benefit of your suggestions and guidance in the operation of various developmental activities which are afoot.

We consider it, Sir, that it is a signal record of your love and affection for the State, that too in your old age and fully twenty years after your retirement from service in the State,

you have taken on yourself to visit and see your past activities. We thank you most heartily for providing this unique opportunity for us to meet you.

We pray God that He may give you many more years of active life to continue your useful and selfless services.

**Address presented to Dr. Leslie C. Coleman, M.A., Ph.D., C.I.E.,
by the Members of the Mysore Agricultural and Experimental
Union, Ramanagaram Taluk and Friends, on 13th February
1954.**

SIR,

WE, the Farmers of Ramanagaram assembled here, wish to present our heartfelt gratitude to you in appreciation of your long and devoted service to our State for a period of over 25 years in the cause of the agriculturists.

It is at once pleasant and gratifying to feel your keen interest in that after a long period you should have spared your valuable time to visit the remotest parts of our State. And permit us to place on record our appreciation at your having come to our town.

We still remember and cherish the prizes received at your hands as Director of Agriculture for plots of H 22 Ragi and HM 320 Sugarcane grown by some of our leading ryots here.

In meeting you as members of the Agricultural and Experimental Union, it is our duty to feel the privilege of belonging to an association founded by yourself and we have no doubt that on a number of points your advice will be of great value to us.

Though on an occasion like this a list of our requirements and needs may be out of place we are impelled by your love to us to place the same before you for kind consideration and recommendation.

1. Construction of a number of tanks and pick-ups in view of this taluk being surrounded by hillocks on all sides.

2. Further supply of electric power to the rural parts for agriculture and home industry,

3. A Breeding Station of Hallikar Cattle in the Taluk and an Agricultural Experimental Farm.

4. Improvement in rural transportation facilities to help agricultural marketing.

5. Establishment of an Agricultural Bank for the Taluk.

Our sincere thanks to you for having found time to be amidst us this evening.

**Address presented to Dr. Leslie C. Coleman, M.A., Ph.D., C.I.E.,
on his Visit to Channapatna Taluk, by the Mysore
Agricultural and Experimental Union, Channapatna Taluk,
on 13th February 1954.**

Dear Sir,

WE, the Members of the Taluk Agricultural and Experimental Union, while extending a warm welcome to you, feel it a unique honour to have you amidst us this morning. On this occasion with your kind permission we wish to make a merited mention of your long and spectacular service rendered to the State of Mysore for nearly three decades. It is no exaggeration to say that you with your profound knowledge of Agriculture in Western countries in all its practical aspects as applicable to the conditions obtaining in this State and with a far-sighted vision calculated to the best interests of the poor agriculturists, laid virtually the solid foundation of the Department of Agriculture in Mysore giving it a new orientation. The substantial work turned out during your regime here is recalled repeatedly with sweet remembrance by the people of the State in general and the agriculturists in particular.

Some of the major items of work executed during your stay here are soil survey of the State, starting the Sugar Factory, starting the Cattle Breeding Station, starting of the Serum Institute. Above all, the successful fight against the "KOLE-ROGA" of areca and the attack against grasshoppers on jola, during your time are of the greatest relief to the ryots who owe their deep debt of gratitude to you. The ryots are also grateful to you in no small measure for the introduction of Mysore plough and for the benefit derived by them arising out of the methods of intensive cultivation sponsored by you.

We now seek your kind permission, Sir, to present to you in brief the activities of our Union. This Union is affiliated to the State Agricultural and Experimental Union started by you in the year 1918 on the lines of similar union in Canada. Our taluk Union consists of 750 members with 7 life-members. The main activities of the Union comprise celebration of Field Days off and on coupled with student farmers' clubs in various places of the taluk. In addition, under the auspices of the Union a vigorous propaganda on the decided advantages to the ryots arising out of the Japanese system of paddy cultivation is carried on with sufficient encouragement from the Union to the ryots. Consequently, an area to the tune of over 2,000 acres has been brought under such system of cultivation of paddy. The ryots are now fully convinced of the marked increase in production of paddy with considerable reduction of seed paddy utilised under this system. There is no doubt in coming years there will be considerable response from the ryots to take advantage of this system of cultivation to step up production and consequently raise the standard of their living. The last objective of this Union is to have a building of its own at the earliest moment. This aspiration of the Union will be quickly materialised, should there be some aid from Government to supplement the contributions from the members of the Union in this behalf. At this stage of progress of this Union we feel, Sir, that advice from you would go a long way to quicken the tempo of activities of this Union. We anxiously await your valuable advice at this juncture to inspire us into increased activity in the light of the strenuous efforts of yours to review the state of agriculture here by covering almost all taluks of the State during the last few months.

THE MYSORE AGRICULTURAL AND EXPERIMENTAL UNION SINCE 1934 TO-DATE

ALMOST the first feeling that finds expression when comparing the condition of the Union as at present with the condition as in the middle thirties is that the membership has considerably increased. This increase began in the early part of the last decade. The Silver Jubilee of the Union was celebrated in 1945. And that was also the year in which the record increase could be announced. The annual membership with a good deal of fluctuation is averaging about 3,000 at present.

Main Body of Members.—This number refers to members who pay an annual fee of Rs. 3-4-0 which practically covers the subscription to the *Union Journal*.

Life-Members.—With the increase in this class of membership however fluctuating, the management of the Union conceived the idea of stabilising itself and it was decided to have a class of members paying a life fee of Rs. 100. The number of these life-members is now over 300.

Four-anna Members.—The constitution of the Union was modified a little at the beginning of the current year with the chief motive of popularising it. And with this in view it was decided to have a class of members paying only four annas a year. It has been so arranged that a group of these basic members residing in a village can form a village association.

The four-anna membership is in fact a modification of the programme of affiliated village associations that was abandoned a few years ago.

Regional Committees.—The formation of regional committees to serve the interests of a large number of local members was long thought of. The idea was pursued so that the district and Taluk committees of the Union are now working all over the State. With the gathering of a large number of members consequent on the organisation of the four-anna membership, it is envisaged that Hobli committees also will be formed. And the extension services coming to the aid of the Union may well be expected to build its structure up from the grass roots level of the village associations as well.

Farmers' Field.—On examining the idea behind the name of the Union and thinking of the basic work which sponsored the organisation one may well ask the question, what of the individual farmers? And are members taking interest in trying experiments and departmental recommendations on their holdings? The answer to this query must in fact be given from two directions, one from the direction of the attempts made by the Department of Agriculture to have a number of tests made on the farmers' fields, and secondly, from the direction of the interest taken by the farmers themselves to have the tests tried on their lands. While the Union has continued to stress on the point that it is predominantly an organisation for taking stock of the effort of the members from their side in regard to this experimentation, the *modus operandi*, the statement of objectives and the formula for gauging results have been subjected to a number of complicated factors.

Demonstration by the Department.—About the year 1939-40 the Department of Agriculture put forward a bold scheme of demonstrations on the farmers' fields, taking into its programme thousands of clients many of whom were not necessarily members of the Union as such. Later followed the subvention plots and other co-operative undertakings in which the Department of Agriculture and other farming public were partners. And all along the Union remained a means of just telling its members how they could co-operate with the Department in these schemes and benefit by observing the local trials.

In terms of their own way of taking to new methods of cultivation and new varieties of crops the members have always exhibited great interest. And going through the farms of several members it has been possible to record a good deal of progress.

Crop Competition.—Crop competitions have later been considered a means of focussing attention on growing of better crops but so far it has not been possible to establish a voluntary enthusiasm for a systematic programme of this kind. This season the Union wanted to arouse some interest in having a competition for the ragi crop but the response has been meagre.

Youth Clubs.—The idea of forming youth clubs discussed in the *Union Journal* as long back as 1936 was taken up as a programme during the last 3 or 4 years after discussing in a sub-

committee and formulation of details. More than 50 clubs have been sponsored in the districts and their problems watched.

It is of interest to note that in the Project area at Malvalli also a number of Village Youth Clubs have been formed as one of the possible community works to be taken up.

So far experience both in the Project area and out in the district has indicated that students and village youths easily take to vegetable-growing. Even this is good achievement if more intensively followed. But diversification by way of poultry raising and other projects is already envisaged and viewed in that light the Youth Club Movement is likely to prove a great force for improved farming.

Little as is the attempt that has been made regarding student farmers' clubs, much of it has been possible by the co-operation rendered by the educational institutions. The Director of Public Instruction is again being requested to extend the kind patronage of the Department to this movement. And by that means it is hoped to establish the clubs working on a voluntary basis on the model of 4-H clubs.

The problem of lands on which the students can work has already arisen. It has been found that a plot of ground almost becomes the hub in the establishing of a club; and such plots obtained by the kind co-operation of donors and allotted to the clubs may lead to the establishment of nucleus plots which while mainly serving the club interest, may all the same prove to be good demonstration plots also.

In some instances where school gardens have been allotted to the students for group work, it is seen that a few beds have been used as nurseries for cabbage and other seedlings which are later taken by individual students to their homes to be planted in the backyards. This is carrying the project to the home which is in fact the basic principle of extension.

Economics.—One of the objectives of the Union was that the members should study costs of cultivation and base the improvement of their farms on economic facts gleaned by them. This economic outlook and interest in allied scientific topics has continued to exercise the minds of our members all through and draw them into the fold of the Union. And from that point of view the mention of a few points may not be out of place.

Cash crops, surplus and profits, costs of cultivation, such were the motives that largely held the ground at the beginning of the period under review. Since then we have gone through a period of general want, war, post-war problems, rations and controls. Earlier economic motives still count a good deal but such factors as self-sufficiency as pertaining to an individual holding and consequently to a village and a district have also claimed considerable attention. Food and nutrition have come to compete for headlines. In such circumstances it is to be specially stated that a Grow More Paddy Scheme was sponsored in Mysore a few years in advance of the general Grow More Food Campaign.

Members have observed with interest the appearance of machinery on the agricultural horizon, and the attempt of co-operative enterprises to widen their field, the growing importance of dairying pointing to the necessity of bestowing attention on farming for fodder, and the spreading of soil consciousness showing itself in practical measures like manufacture of compost and planting of trees.

Field-Days.—Our Field-Days have moved to the villages. The advantages of holding Field-Days on Government Farms where several items of research can be seen are appreciated by the members; but in addition to these programmes on the larger farms quite a number were arranged in recent years as harvest festivals on basic farms which were organised in all the districts. But the Field-Days held in the villages where new crops have been grown and new trials made by the members have been found to further rouse the interest of the farmers. It is a pleasure to mention that quite a number of our leading members are coming forward to arrange these field-days in their villages and stand as hosts.

The more comprehensive of these Field-Days have included on their programmes such items as going round the fields, various field competitions among the villages, the village cattle and poultry show; exhibition of village products by way of roots, fruits and vegetables, group discussions, lectures on agricultural subjects and movie shows.

Journals.—The journals published by the Union have been kept up and the 30th volumes of the both English and Kannada journals are about to be commenced.

Government Help.—The help received from the Government has to be gratefully acknowledged. The subvention which ranged between Rs. 1,000 and Rs. 2,500 a year was raised to Rs. 5,000 last year. While it is remembered that the Union in many an aspect of its constructive works puts into effect much that is contemplated under Information and Extension Services, the help rendered to the Union may be said to be deserving of even greater proportions.

Building Proposed.—With its accumulated funds, the Union has planned to have its own buildings at the Centre. According to its new constitution much of the annual fees are allotted to the district branches and with the attempts already made by certain branches, district buildings are also likely to be raised in due course.

Future Programme

1. Gathering more members.
2. Completing its structure from village associations to the Central organisation.
3. Seeing to the raising of the Central and the Branch buildings.
4. Sponsoring Student Farmers' Clubs.
5. And keeping the organisation active in respect of the details of work indicated in the above paragraphs and also such other programmes that may be suggested from time to time.

Agricultural Seminar.—During several meetings of its Managing Committee, the Union has considered the question of holding an Agricultural Seminar. A beginning has been made at the Union to see this programme through and with necessary sanctions and co-operation is likely to be an important piece of work for the Union during the next 6 months or 1 year.

This is perhaps a fair though a brief enumeration of the future programme of the Union and may be said to be in consonance with the general planning that is made for the rejuvenation of the country.

Correspondence

OBSERVATIONS ON THE DURATION OF TIME TAKEN BY CROP PLANTS FROM FLOWERING TO MATURITY

D. VENKATARAMANIAH

THE writer who is a student of agriculture made the following observations at his leisure, of a few perennial cotton plants grown in his compound for religious purposes. These consisted of two types, the first one locally known as ಜಸೆಹತ್ತಿ without the petal spot and the other one also a tree cotton having petal spots belonging to *G. peruvianum* type. The observations were started in 1948 and continued during the years 1949, 1952 and 1953 as and when opportunity occurred :

Date of flowering	Date of dehiscence of the boll	Duration of time taken (in days)
23-9-1948	27-11-1948	66
29-11-1948	5-2-1949	68
19-1-1949	14-3-1949	54
26-3-1949	19-5-1949	56
1-6-1949	5-8-1949	64
4-6-1949	7-8-1949	63
15-9-1949	15-11-1949	60
18-9-1949	23-11-1949	65
3-2-1952	1-4-1952	57
4-2-1952	2-4-1952	57
2-3-1952	19-4-1952	48
4-3-1952	30-3-1952	58
	2-4-1952	
4-9-1952	1-11-1952	57
16-8-1953	11-10-1953	56
17-8-1953	17-10-1953	61
19-8-1953	18-10-1953	60
19-8-1953	26-10-1953	68
13-9-1953	2-11-1953	51

Duration of time appears to be short during summer, being only 48 days in April-May and extends up to 68 days from August to November, being rainy and winter months. Flowering season of the perennial cotton plants as observed by the writer are the months of January to March and June to September. Out of curiosity, the writer happened to plant a few

sannahatthi (*G. herbaceum*) in April 1952 and made only a few of the following observations :

Date of opening of the flower	Date of dehiscence of the boll and picking cotton	Duration (in days)
9-9-1952	21-10-1952	42
11-6-1952	25-7-1952	45

Similar observations are being made on other crop plants like the cowpea (*Vignor caliang*) and recorded.

Date of flowering	Date of harvest	Duration (in days)
26-8-1949	14-8-1949	20
18-9-1949	10-10-1949	23
9-1-1950	30-1-1950	21
9-1-1950	3-2-1950	24
14-6-1952	3-7-1952	19
15-6-1952	6-7-1952	21
20-10-1953	13-11-1953	24
22-10-1953	14-11-1953	23
3-11-1953	24-11-1953	23
4-11-1953	27-11-1953	23
10-11-1953	30-11-1953	20
10-11-1953	5-12-1953	25

The shortest duration of time, viz., 19 days was in the months of June-July and the longest time taken, viz., 25 days was in the months of November-December and the rest intermediate between the above two extremes.